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AH500 **Hardware & Operation Manual**

AH500 Hardware & Operation Manual

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AH500 Hardware and Operation Manual

Revision History

Version	Revision	Date
1st	1. The first version was published.	2013/03/28
2nd	2. The information about AHPS15-5A, AH32AM10N-5A, AH32AM10N-5C, AH16AR10N-5A, AH32AN02T-5A, AH32AN02T-5C, AH32AN02P-5A, AH32AN02P-5C, AH08AD-5C, AH08DA-5C, AH08PTG-5A, AH15PM-5A, AH10PFBM-5A, AH10PFBS-5A, AH10COPM-5A, AHRTU-PFBS-5A, AHAADP01/02EF-5A, and DVPAETB-IO34C is added to all chapters. 3. The storage temperature, the program capacity of AHCPU500, the specifications for the input/output relays, the functional specifications for the analog input/output modules, the electrical specifications for the temperature measurement modules, the response characteristics of the input terminals on AH05PM-5A/AH10PM-5A in Chapter 2 are updated. 4. The specifications for AH16AR10N-5A, and, the specifications for AH15PM-5A, and the specifications for AHPS15-5A are added to Chapter 2. 5. Section 4.2.1 is updated. 6. Section 5.1.1 is updated. 7. Point (6) is added to section 6.6.1. 8. Section 9.3.2.1 is updated. 9. Section 11.2.3 is updated, and section 11.3 is added to Chapter 11. 10. The troubleshooting for new models is added to Chapter 12. 11. The AH500 addresses of the T devices and the AH500 addresses of the C devices in Appendix B are updated.	2014/06/13
3rd	1. Information concerning AHCPU511-RS2, AHCPU511-EN, AHCPU521-EN, AHCPU531-EN, AH08AD-5A and AH08DA-5A is added. 2. Information concerning larger program capacity and memory, Serial control interface with multiple functions and high-speed Ethernet communication interface is updated to section 1.3. 3. Instruction execution speed, maximum number of Information concerning backplanes which can be connected is updated in section 2.2.1. Information concerning AH500 advanced CPU modules is added to section 2.2.2. Information concerning arrangement of AH32AN02P-5 input/output terminals is updated in section 2.4.4. Information concerning Interrupt input terminals of AH05PM-5A and input signals as well as terminal X1.2~X1.5 of AH15PM-5A and AH20MC-5A is updated in section 2.8.1. Informaiton concering the applicable input/output module is updated in section	2016/08/15

Version	Revision	Date
	2.11.1. 4. Information concerning latched area in the device range is updated in section 5.1.4. 5. Information concerning specifications for SD card is updated in section 7.1.2. 6. Information concerning address is updated in section 8.3.2. 7. Information concerning AHCPU5X0 is added in chapter 9. 8. Information concerning AHCPU5X0 is added to section 11.1, 11.1.4, 11.2, 11.3, and 11.4. 9. Section 12.2.1, 12.2.2, 12.2.3, 12.2.5, 12.3.2, 12.4.1 are updated. 10. Information concerning installation in Windows 8 is added in Appendix A. 11. Section B.2 is removed from Appendix B.	
4th	1. New contents concerning AH15SCM-5A, AHRTU-ETHN-5A are added in chapter 1. 2. New contents concerning module weights are added in chapter 2 and I/O connection cable models input/output terminals of AH series are also updated. 3. New information about EtherNet/IP is added in section 11.5. 4. New contents concerning EtherNet/IP troubleshooting are added in section 12.2.5 and delete the error codes 16#9B01~16#9B20. 5. New contents concerning installing the USB driver in Windows 7 and Windows 10 are added in Appendix A.	2017/03/31
5th	1. New contents concerning AH15EN-5A, AHCPU501-RS2, AHCPU521-RS2, AHCPU531-RS2, and AHCPU501-EN are added. 2. New contents concerning AHCPU501-RS2, AHCPU521-RS2, AHCPU531-RS2, AHCPU501-EN, AH04HC-5A and redundancy system are added in Chapter 2. 3. Updated contents concerning ISPSoft in Chapter 6, 7 8 and 9. 4. Updated contents concerning applicable memory cards in Chapter 7. 5. Updated the maximum characters can be input for the CPU naming. Update the software supported and its versions for the network I/O module in Chapter 8. 6. Updated parameters for network communication settings in Chapter 9. 7. Added new product information concerning AHCPU501-RS2, AHCPU521-RS2, AHCPU531-RS2, AHCPU501-EN in Chapter 11. 8. Updated troubleshooting procedures, 16#0014, 16#A0FC, and error LED information in Chapter 12.	20180515

Version	Revision	Date
6^{th}	1. AH500 Hardware Manual and AH500 Operation Manual are combined into AH Series Hardware and Operation Manual to enhance more concise reading experiences. 2. Added contents from Chapter 1 of AH500 Hardware Manual to Chapter 1 of AH500 Hardware and Operation Manual and updated ISPSoft operation images. 3. Added contents from Chapter 3 of AH500 Hardware Manual to Chapter 2. Added new product information AHCPU521-DNP, updated CPU module specifications, including connection limit and electrical isolation. 4. Updated installing information in Chapter 3. 5. Added contents from Chapter 2 and 5 of AH500 Hardware Manual in Chapter 4. 6. Added contents from Chapter 4 of AH500 Hardware Manual in Chapter 5. 7. Updated ISPSoft and HWCONFIG 4.0 operation images and descriptions in Chapter 6, 7, 8, and 9. 8. Updated contents in SM table and updated ISPSoft and HWCONFIG 4.0 in Chapter 11. Updated web function contents in section 11.4. Added contents of data tracer in section 11.6 and data logger in section 11.7. 9. Added contents from Chapter 9 of AH500 Hardware Manual in Chapter 12. 10. Added Appendix C to introduce EMC Standards and Appendix D to illustrate Maintenance and Inspection.	2021/3/25

AH500 Hardware and Operation Manual

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Chapter 4 Installing Hardware

Chapter 12 Troubleshooting

Chapter 1 Introduction

Table of Contents

1

1.1 Introduction

This manual introduces the AH500 Series PLC CPU functions, devices, module tables, basic instructions, applied instructions, electrical specifications troubleshooting, as well as appearances, dimensions, and so forth.

1.1.1 Related Manuals

The related manuals of the AH500 series programmable logic controllers are composed of the following

- AH500 Quick Start
  This guides users to use the system before they read the related manuals.
- AH500 Programming Manual
  This introduces the programming of the AH500 series programmable logic controllers, the basic instructions, and the applied instructions.
- ISPSoft User Manual
  This introduces the use of ISPSoft, the programming language (Ladder, IL, SFC, FBD, and ST), the concept of POUs, and the concept of tasks.
- AH500 Hrdwaew and Operation Manual
  This introduces electrical specifications, appearances, dimensions, CPU functions, devices, module tables, troubleshooting, and so forth.
- AH500 Module Manual
  This introduces the use of special I/O modules. For example, network modules, analog I/O modules, temperature measurement modules, motion control modules, and etc.
- AH500 Motion Control Module Manual
  This introduces the specifications for the motion control modules, the wiring, the instructions, and the functions.
- PMSoft User Manual
  This introduces the use of PMSoft, including the editing mode, the connection, and the password setting.
- AH500 Redundancy System Operation Manual
  This introduces the AH500 redundancy structures, establishments, programming designs, and operations.

1.1.2 Description of Models

Classification	Model Name	Description
Power supply module	AHPS05-5A	100~240 V AC 50/60 Hz
	AHPS15-5A	24 V DC
CPU module	AHCPU500-RS2	It is a basic CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 768 inputs/outputs. The program capacity is 32K steps.
	AHCPU500-EN	It is a basic CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 768 inputs/outputs. The program capacity is 32K steps.
	AHCPU501-RS2	It is an advanced CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 768 inputs/outputs. The program capacity is 48K steps.
	AHCPU501-EN	It is an advanced CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 768 inputs/outputs. The program capacity is 48K steps.
	AHCPU510-RS2	It is a basic CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 1280

Classification	Model Name	Description
		inputs/outputs. The program capacity is 64K steps.
	AHCPU510-EN	It is a basic CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 1280 inputs/outputs. The program capacity is 64K steps.
	AHCPU511-RS2	It is an advanced CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 1280 inputs/outputs. The program capacity is 96K steps.
	AHCPU511-EN	It is an advanced CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 1280 inputs/outputs. The program capacity is 96K steps.
	AHCPU520-RS2	It is a basic CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 2304 inputs/outputs. The program capacity is 128K steps.
	AHCPU520-EN	It is a basic CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 2304 inputs/outputs. The program capacity is 128K steps.
	AHCPU521-RS2	It is an advanced CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 2304 inputs/outputs. The program capacity is 192K steps.
	AHCPU521-EN	It is an advanced CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 2304 inputs/outputs. The program capacity is 192K steps.
	AHCPU530-RS2	It is a basic CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 4352 inputs/outputs. The program capacity is 256K steps.
	AHCPU530-EN	It is a basic CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 4352 inputs/outputs. The program capacity is 256K steps.
	AHCPU531-RS2	It is an advanced CPU module with two built-in RS-485 ports, one built-in USB port, and one built-in SD interface. It supports 4352 inputs/outputs. The program capacity is 384K steps.
	AHCPU531-EN	It is an advanced CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports 4352 inputs/outputs. The program capacity is 384K steps.
	AHCPU521-DNP	It is an advanced CPU module with one built-in Ethernet port, one built-in RS-485 port, one built-in USB port, and one built-in SD interface. It supports DNP3, 2304 inputs/outputs. The program capacity is 192K steps.
	AHCPU560-EN2	It is a redundant CPU module with one built-in Ethernet port, one built-in RS-485/RS-232 port, one built-in USB port, and one built-in SD interface. It supports 65536 inputs/outputs. The program capacity is 1M steps.
Main backplane	AHBP04M1-5A	Four-slot main backplane for a CPU/RTU rack
	AHBP06M1-5A	Six-slot main backplane for a CPU/RTU rack
	AHBP08M1-5A	Eight-slot main backplane for a CPU/RTU rack
	AHBP12M1-5A	Twelve-slot main backplane for a CPU/RTU rack
Redundant backplane	AHBP04MR1-5A	Four-slot redundant backplane for a CPU/RTU rack
	AHBP06MR1-5A	Six-slot redundant backplane for a CPU/RTU rack

Classification	Model Name	Description
	AHBP08MR1-5A	Eight-slot redundant backplane for a CPU/RTU rack
Extension backplane	AHBP06E1-5A	Six-slot extension backplane for a CPU/RTU extension rack
	AHBP08E1-5A	Eight-slot extension backplane for a CPU/RTU extension rack
Redundant extension backplane	AHBP06ER1-5A	Six-slot extension backplane with power redundancy for a CPU/RTU redundant extension rack
	AHBP08ER1-5A	Eight-slot extension backplane with power redundancy for a CPU/RTU redundant extension rack
Digital input/output module	AH16AM10N-5A	24 V DC 5 mA 16 inputs Terminal block
	AH32AM10N-5A	24 V DC 5 mA 32 inputs Terminal block
	AH32AM10N-5B	24 V DC 5 mA 32 inputs DB37 connector
	AH32AM10N-5C	24 V DC 5 mA 32 inputs Latch connector
	AH64AM10N-5C	24 V DC 3.2 mA 64 inputs Latch connector
	AH16AM30N-5A	100~240 V AC 4.5 mA~9 mA (100 V, 50 Hz) 16 inputs Terminal block
	AH16AR10N-5A	24 V DC 5 mA 16 inputs Terminal block (I/O interrupts are supported.)
	AH16AN01R-5A	240 V AC/24 V DC 2 A 16 outputs Relay Terminal block
	AH16AN01T-5A	12~24 V DC 0.5 A 16 outputs Sinking output Terminal block
	AH16AN01P-5A	12~24 V DC 0.5 A 16 outputs Sourcing output Terminal block
	AH32AN02T-5A	12~24 V DC 0.1 A 32 outputs Sinking output

Classification	Model Name	Description
		Terminal block
	AH32AN02T-5B	12~24 V DC 0.1 A 32 outputs Sinking output DB37 connector
	AH32AN02T-5C	12~24 V DC 0.1 A 32 outputs Sinking output Latch connector
	AH32AN02P-5A	12~24 V DC 0.1 A 32 outputs Sourcing output Terminal block
	AH32AN02P-5B	12~24 V DC 0.1 A 32 outputs Sourcing output DB37 connector
	AH32AN02P-5C	12~24 V DC 0.1 A 32 outputs Sourcing output Latch connector
	AH64AN02T-5C	12~24 V DC 0.1 A 64 outputs Sinking output Latch connector
	AH64AN02P-5C	12~24 V DC 0.1 A 64 outputs Sourcing output Latch connector
	AH16AN01S-5A	100~240 V AC 0.5 A 16 outputs TRIAC Terminal block
	AH16AP11R-5A	24 V DC 5 mA 8 inputs 240 V AC/24 V DC 2 A 8 outputs Relay Terminal block
	AH16AP11T-5A	24 V DC 5 mA 8 inputs 12~24 V DC 0.5 A 8 outputs

Classification	Model Name	Description
		Sinking output Terminal block
	AH16AP11P-5A	24 V DC 5 mA 8 inputs 12~24 V DC 0.5 A 8 outputs Sourcing output Terminal block
Analog input/output module	AH04AD-5A	Four-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH08AD-5A	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH08AD-5B	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, and -10 V~10 V Conversion time: 150 us/channel
	AH08AD-5C	Eight-channel analog input module Hardware resolution: 16 bits 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel
	AH04DA-5A	Four-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
	AH08DA-5A	Eight-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA Conversion time: 150 us/channel
	AH08DA-5B	Eight-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, and -10 V~10 V Conversion time: 150 us/channel
	AH08DA-5C	Eight-channel analog output module Hardware resolution: 16 bits 0/4 mA~20 mA Conversion time: 150 us/channel
Analog input/output module	AH06XA-5A	Four-channel analog input module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, 0/4 mA~20 mA, and -20 mA~20 mA Conversion time: 150 us/channel Two-channel analog output module Hardware resolution: 16 bits 0/1 V~5 V, -5 V~5 V, 0 V~10 V, -10 V~10 V, and 0/4 mA~20 mA Conversion time: 150 us/channel
Temperature measurement	AH04PT-5A	Four-channel four-wire/three-wire RTD Sensor type: Pt100/Pt1000/Ni100/Ni1000 sensor, and 0~300 Ω

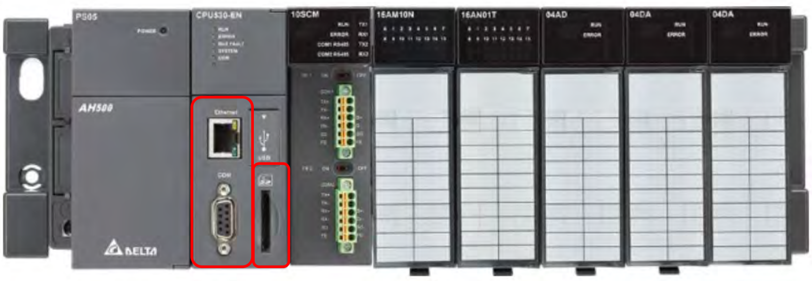
Classification	Model Name	Description
module		input impedance Resolution: 0.1°C/0.1°F (16 bits) Four-wire conversion time: 150 ms/channel Three-wire conversion time: 300 ms/channel
	AH08PTG-5A	Eight-channel four-wire/three-wire/two-wire RTD Sensor type: Pt100/Pt1000/Ni100/Ni1000, and 0~300 Ω input impedance Resolution: 0.1°C/0.1°F (16 bits) Conversion time: 20 ms/4 channels and 200 ms/8 channels
	AH04TC-5A	Four-channel thermocouple Sensor type: J, K, R, S, T, E, N, and -150~+150 mV Resolution: 0.1°C/0.1°F Conversion time: 200 ms/channel
	AH08TC-5A	Eight-channel thermocouple Sensor type: J, K, R, S, T, E, N, and -150~+150 mV Resolution: 0.1°C/0.1°F Conversion time: 200 ms/channel
Motion control module	AH02HC-5A	Two-channel high-speed counter module (200 kHz)
	AH04HC-5A	Four-channel high-speed counter module (200 kHz)
	AH05PM-5A	Two-axis pulse train motion control module (1 MHz)
	AH10PM-5A	Six-axis pulse train motion control module (Four axes: 1 MHz; Two axes: 200 kHz)
	AH15PM-5A	Four-axis pulse train motion control module (1 MHz)
	AH20MC-5A	Twelve-axis DMCNET (Delta Motion Control Network) motion control module (10 Mbps)
Network module	AH10EN-5A	It is an Ethernet communication module. It can function as a mater or a slave. It is equipped with two Ethernet ports, and supports a Modbus TCP master and EtherNet/IP (V2.0).
	AH15EN-5A	It is an Ethernet communication module. It can function as a mater or a slave. It is equipped with two Ethernet ports, and supports a Modbus TCP master and IEC60870-5-104.
	AH10SCM-5A	It is a serial communication module with two RS-485/RS-422 ports, and supports Modbus and UD Link protocols. One part of communication is isolated from the other part of the communication, and one part of power is isolated from the other part of the power.
	AH15SCM-5A	It is a serial communication module with two RS-232 ports, and supports Modbus and UD Link protocols. One part of communication is isolated from the other part of the communication, and one part of power is isolated from the other part of the power.
	AH10DNET-5A	It is a DeviceNet communication module. It can function as a master or a slave. The maximum communication speed is 1 Mbps.
	AH10PFBM-5A	PROFIBUS-DP master module
	AH10PFBS-5A	PROFIBUS-DP slave module
	AH10COPM-5A	It is a CANopen communication module. It can function as a master or a slave.
Remote I/O module	AHRTU-DNET-5A	DeviceNet remote I/O module
	AHRTU-PFBS-5A	PROFIBUS-DP remote I/O module
	AHRTU-ETHN-5A	Ethernet remote I/O module
Extension cable	AHACAB06-5A	0.6 meter extension cable for connecting an extension backplane
Extension cable	AHACAB10-5A	1.0 meter extension cable for connecting an extension

Classification	Model Name	Description
		backplane
	AHACAB15-5A	1.5 meter extension cable for connecting an extension backplane
	AHACAB30-5A	3.0 meter extension cable for connecting an extension backplane
	AHAADP01EF-5A/ AHAADP02EF-5A	Fiber optics modules for extension backplanes
I/O extension cable	UC-ET010-24A	1.0 meter I/O extension cable (latch connector) for AH32AM10N-5C and AH64AM10N-5C
	UC-ET010-24C	1.0 meter I/O extension cable (latch connector) for AH32AN02T-5C, AH32AN02P-5C, AH64AN02T-5C and AH64AN02P-5C
	UC-ET010-33B	1.0 meter I/O extension cable (DB37 connector) for AH32AM10N-5B, AH32AN02T-5B, and AH32AN02P-5B
	UC-ET010-13B	1.0 meter I/O extension cable for AH04HC-5A and AH20MC-5A
	UC-ET010-15B	1.0 meter I/O extension cable for AH10PM-5A and AH15PM-5A
External terminal module	UB-10-ID32A	I/O external terminal module for AH32AM10N-5C and AH64AM10N-5C 32 inputs
	UB-10-OR16A	I/O external terminal module for AH32AN02T-5C and AH64AN02T-5C 16 relay outputs
	UB-10-OR16B	I/O external terminal module for AH32AN02P-5C and AH64AN02P-5C 16 relay outputs
	UB-10-ID32B	I/O external terminal module for AH32AM10N-5B 32 inputs
	UB-10-OR32A	I/O external terminal module for AH32AN02T-5B 32 relay outputs
	UB-10-OR32B	I/O external terminal module for AH32AN02P-5B 32 relay outputs
	UB-10-OT32A	I/O external terminal module for AH32AN02T-5C, AH32AN02P-5C, AH64AN02T-5C, and AH64AN02P-5C 32 transistor outputs
	UB-10-OT32B	I/O external terminal module for AH32AN02T-5B and AH32AN02P-5B 32 transistor outputs
	UB-10-IO16C	I/O external terminal module for AH04HC-5A and AH20MC-5A
	UB-10-IO24C	I/O external terminal module for AH10PM-5A
	UB-10-IO34C	I/O external terminal module for AH15PM-5A
Space module	AHASP01-5A	Space module used for an empty I/O slot

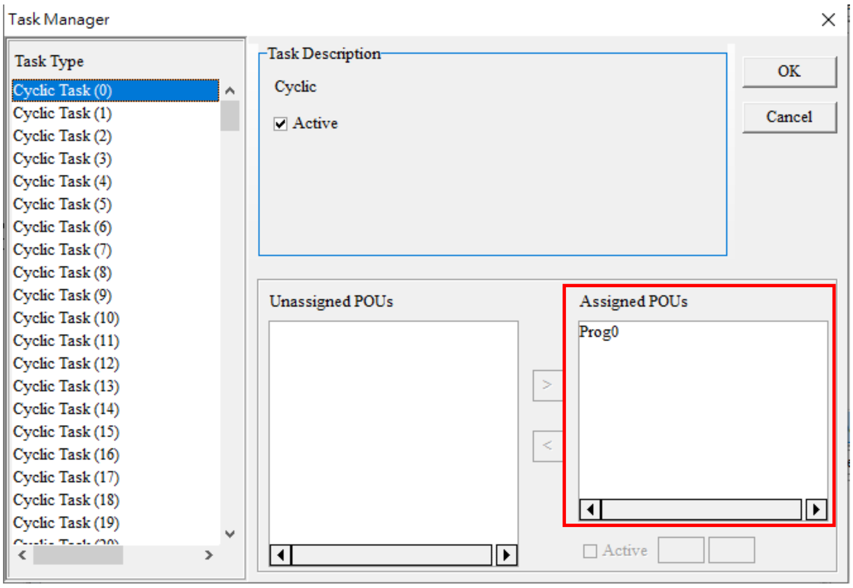
1.2 Overview

An AH500 series CPU module is a medium type of advanced controller with built-in communication ports. It provides a strong network function for users, and users can create connection among devices on the network through software. An AH500 series CPU module also provides structured programming. Users can assign programs to different tasks, and write a program which is frequently executed in a function block. Besides, users can choose different programming languages (instruction lists (IL), structured texts (ST), ladder diagrams (LD), sequential function charts (SFC), and function block diagrams (FBD)) dealt with by IEC 61131-3 according to their needs when writing programs. They can create the AH500 hardware configuration by means of hardware configuration software. They can also restore or back up a system rapidly through the built-in SD interface in an AH500 series CPU module. This manual introduces the basic operation of an AH500 system, and help users familiarize themselves with the AH500 system.

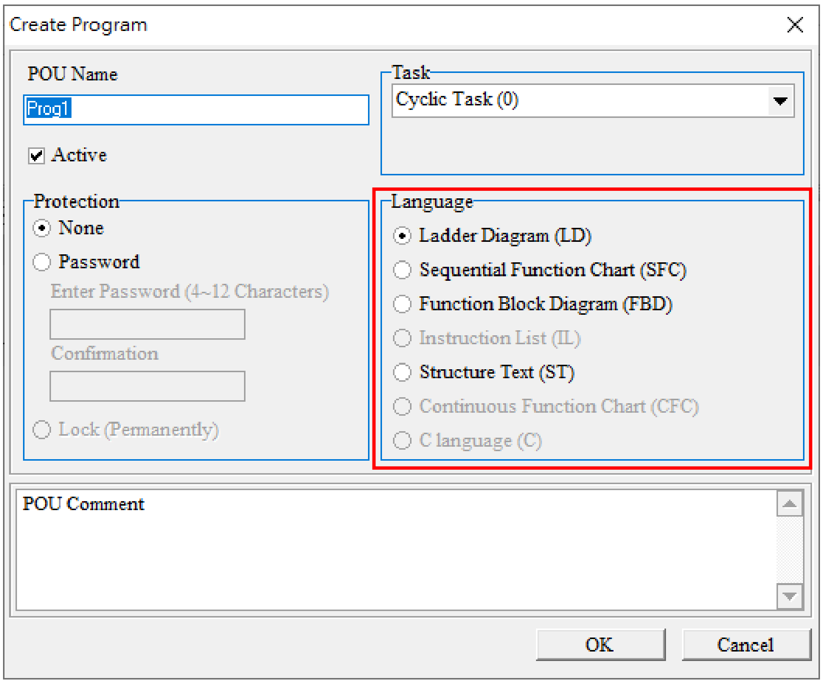
Built-in with multiple communication interfaces, AH500 series CPU module provides user-friendly setting environment for users to create connections with devices easier and more rapidly. Users can restore or back up a system rapidly through the built-in SD interface in an AH500 series CPU module.



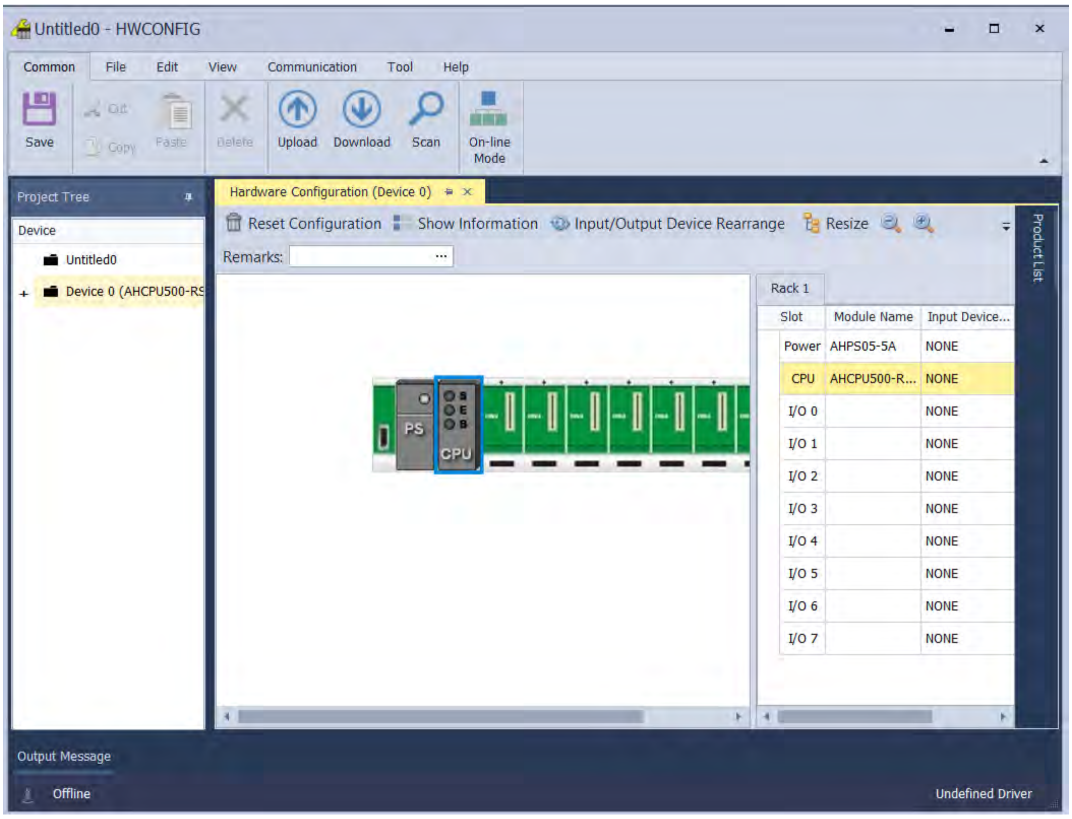
An AH500 series CPU module provides structured programming. You can assign programs to different tasks.



Users can choose different programming languages ladder diagrams (LD), structured texts (ST), sequential function charts (SFC), continuous function chart (CFC) and C language dealt with by IEC 61131-3 according to their needs when writing programs.

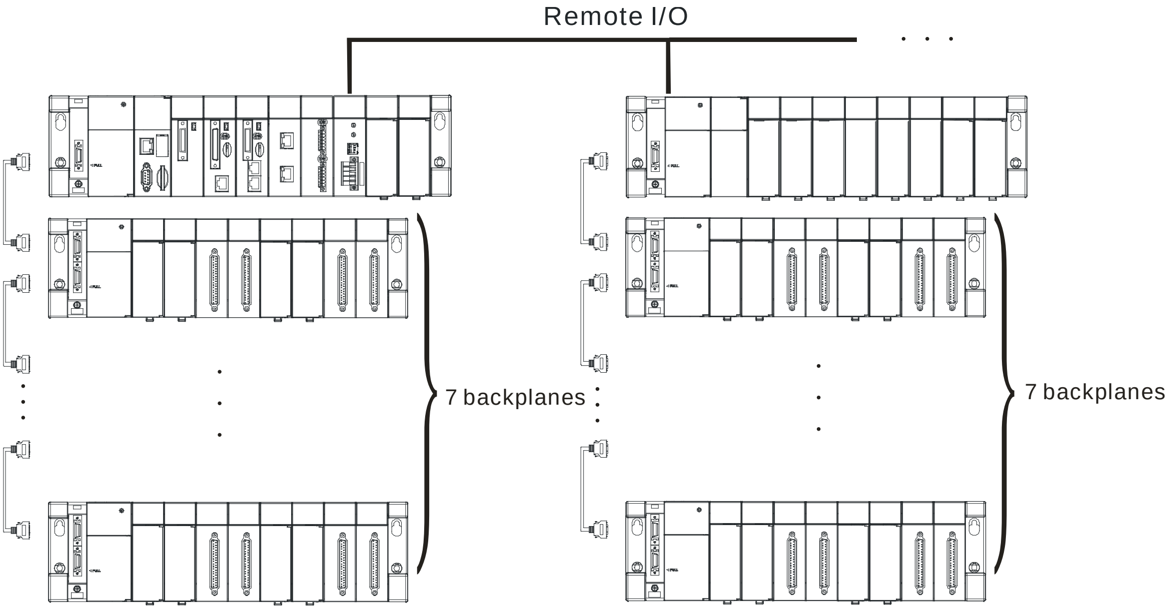


Through HWCONFIG, users can create an AH500 hardware configuration.



1.3 Characteristics

AH500 system illustration



Features of AH500 Series CPU module:

1. **High efficiency**
   - AH500 basic series CPU module: A 32-bit high-speed processor is used. The instructions are executed at a speed of 3K steps/ms. (Fifty percent of the instructions are basic instructions, and fifty percent of the instructions are applied instructions.)
   - AH500 advanced series CPU module: A 32-bit high-speed processor is used. The instructions are executed at a speed of 12K steps/ms. (Fifty percent of the instructions are basic instructions, and fifty percent of the instructions are applied instructions.)
   - AH500 redundant series CPU module: A 32-bit high-speed processor is used. The instructions are executed at a speed of 12K steps/ms. (Fifty percent of the instructions are basic instructions, and fifty percent of the instructions are applied instructions.)

2. **Supporting more inputs and outputs**
   - The AH500 series CPU module supports up to 4,352 local digital I/O or 544 analog I/O.
   - A complete AH500 system consists of eight backplanes at most, including a main backplane. Twelve I/O modules at most can be installed on a main backplane, and eight I/O modules at most can be installed on an extension backplane. Therefore, for the AH500 series CPU, sixty-eight digital input/output modules at most or sixty-eight analog input/output modules at most can be installed.
   - Eight RTU modules at most can be installed on the main backplane.
   - I/O backplanes employ Ethernet communication protocol. Communication distance between backplanes can be as far as 100 meters. If using fiber cables with fiber optics modules AHAADP01/02EF-5A for extension backplanes, the communication distance can reach as far as 2 kilometers.

3. **Multiple I/O modules**
   - The I/O modules supported by the AH500 series CPU module are digital input/output modules, analog input/output modules, temperature measurement modules, network modules, motion control modules, and RTU modules. Refer to section 1.1.2 for more details.

4. **Larger program capacity and memory**

Program capacity

AH500 basic series CPU module (AHCPU500/510/520/530): 32/64/128/256K steps.

AH500 advanced series CPU module (AHCPU501/511/521/531): 48/96/192/384K steps.

AH500 redentant series CPU module (AHCPU560-EN2): 1M steps.

- Providing with a wider module selection for users to select a suitable CPU module according to their program capacity needs.
- Memory

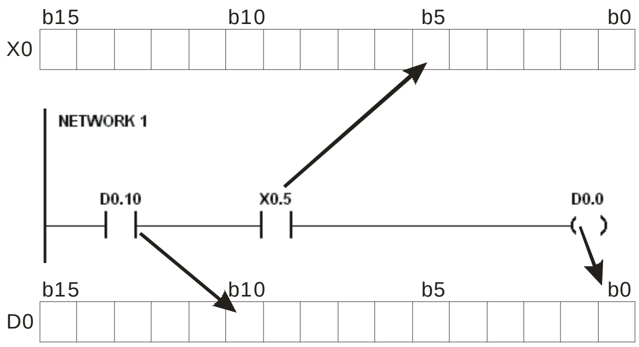
AH500 basic series CPU module (AHCPU500/510/520/530): 16/32/64K words of memory and 64/256/512/1024 function blocks to be declared.

AH500 advanced series CPU module (AHCPU501/511/521/531): 24/48/96/128K words of memory and 512/1024/2048/4096 function blocks to be declared.

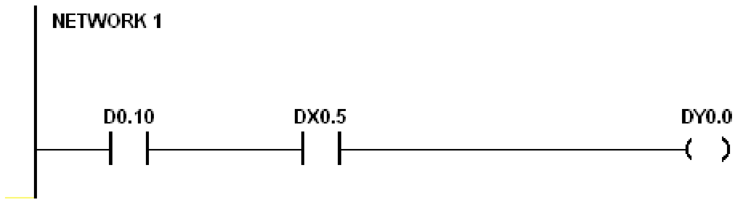
AH500 redundatn series CPU module (AHCPU560-EN2): 256K words of memory and 8192 function blocks to be declared.

5. **Devices which can be used conveniently in a program**

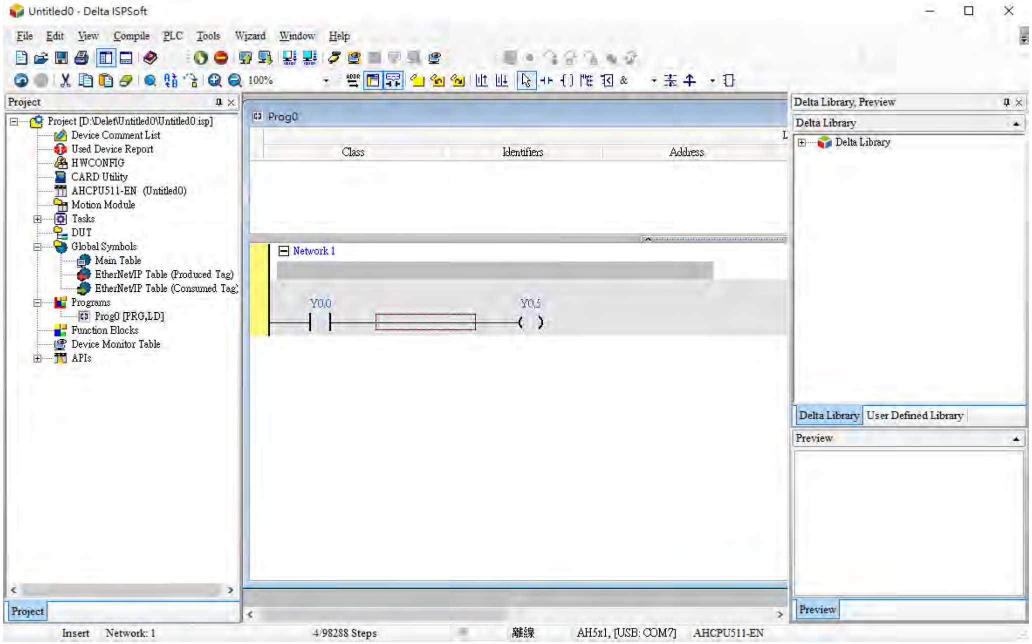
- An AH500 series CPU module is equipped with devices which can be used conveniently in a program. Users can flexibly specify a bit in a word device, e.g. D0.0, X0.0, and Y0.0. Owing to that bits in a word device can be specified, these bits can function as contacts and coils.



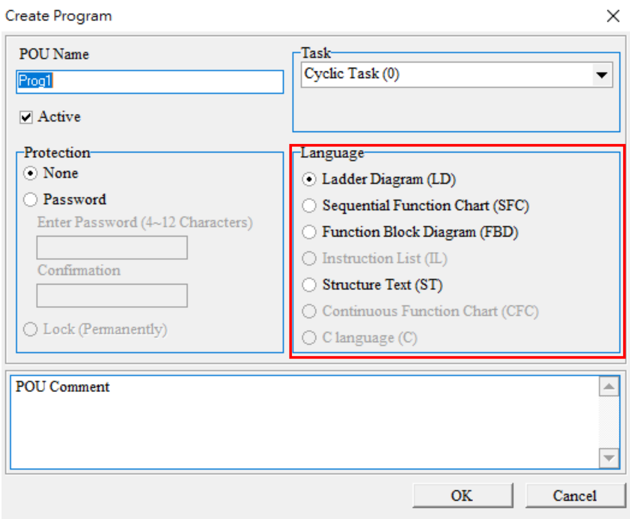
- Users can access the state of DX0.0 and that of DY0.0 in a program. The state of DX0.0 and that of DY0.0 are not limited by scan time. They are refreshed immediately in a program.



6. Supporting IEC 61131-3



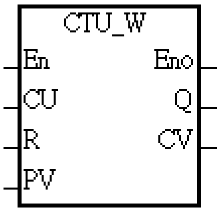
- The AH500 series CPU module supports IEC 61131-3.
- The programming languages which are supported are ladder diagrams (LD), sequential function charts (SFC), function block diagrams (FBD) and structured texts (ST).



- Users can select a programming language according to their preference and the convenience. The programming languages support one another so that the programs written by different users are related.

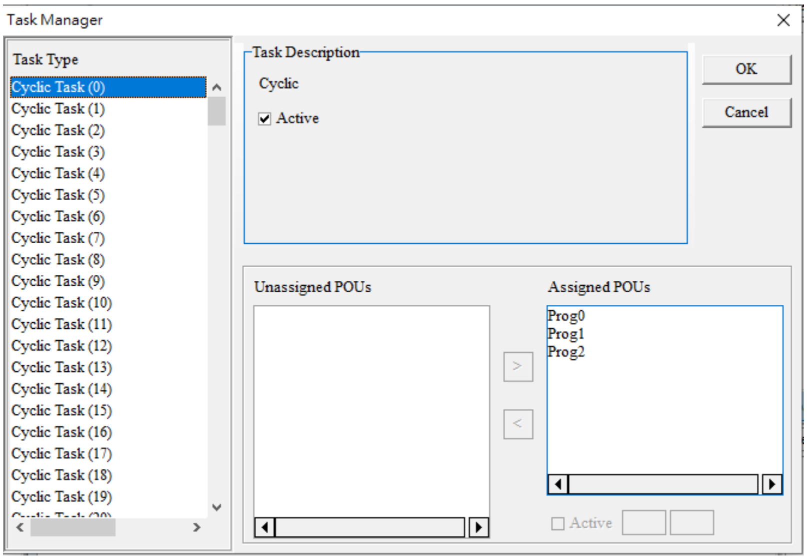
7. Strong function block

- Not only the standard IEC61131-3 function blocks are supported, but also the convenient function blocks provided by Delta Electronics, Inc. are supported. Users can write the program frequently executed in a function block so that the program becomes more structured and can be executed more conveniently.
- The symbol for a function block in a ladder diagram is like an Integrated circuit (IC) in a circuit diagram. Owing to the fact that the ladder diagram is based on the traditional circuit diagram, the operation of a function block is quite similar to the function of an integrated circuit. Users only need to send the signal to the corresponding input of the function block, and they can receive the signal or state which is required. During the whole process, users do not need to consider the processing procedure inside the function block.



- A function block is a program element equipped with the operation function. It is similar to a subroutine, and is a type of POU (Program Organization Unit). It can not operate by itself, and has to be called through the program POU. After the related parameters are transmitted, the function defined by a function block is executed. Besides, the final operation result can be sent to the device or variable used in the superior POU after the execution of the function block is complete.
- The setting of passwords by means of ISPSoft provides the secrecy of function blocks for special businesses. The program inside a function block can not be learned, and the patent of a business will not be infringed.

8. Task



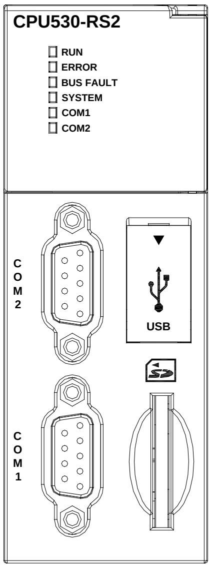
- The programs can be assigned to 283 tasks at most. Among the 288 tasks, 32 tasks are cyclic tasks, 32 tasks are I/O interrupts, 4 tasks are timer interrupts, 2 tasks are communication interrupts, 1 task is an external 24 V low-voltage interrupt, and 212 tasks are user-defined tasks.
- Users can enable and disable a task during the execution of a program by means of TKON and TKOFF.

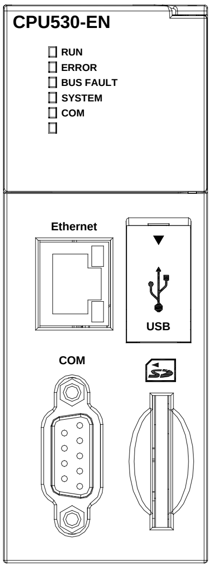
9. Increasing the efficiency of configuring the hardware through an USB cable and ISPSoft

- The AH500 series CPU module provides a standard USB 2.0 interface. USB 2.0 increases the data transfer rate, and decreases the time it takes to download the program, monitor the program and configure the hardware. Besides, users do not need to buy a communication cable for the CPU module. They can use a general USB cable to connect to the AH500 series CPU module.

10. **Serial control interface with multiple functions**

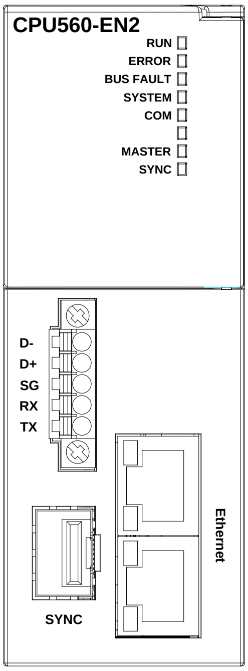
10.1 AH500 basic and advanced series CPU modules





- AHCPU500/501/510/511/520/521/530/531-RS2 provides two DB9 serial control interfaces, i.e. COM1 and COM2.
- AHCPU500/501/510/511/520/521/530/531-EN and AHCPU521-DNP provides one DB9 serial control interface (COM).
- Users can set the DB9 serial control interface to RS-232, RS-485, or RS-422 according to the application environment. The data transfer rate can be increased from 9600 bps to 1 Mbps.
- AH500 basic series CPU module (AHCPU500/510/520/530): After users set the PLC Link in NWCONIFG in ISPSoft, they can exchange the data with a device through the RS-485 serial control interface, and do not need to write any program.
- AH500 advanced series CPU module (AHCPU501/511/521/531): After users set the PLC Link in HWCONIFG in ISPSoft, they can exchange the data with a device through the RS-485 serial control interface, and do not need to write any program.

10.2 AH500 basic and advanced series CPU modules



- AHCPU560-EN2 provides one Eurpean terminal block control interface (COM).
- Users can set the DB9 serial control interface to RS-232 or RS-485, according to the application environment. The data transfer rate can be increased from 9600 bps to 1 Mbps.
- AH500 redundant series CPU module (AHCPU560-EN2): After users set in HWCONIFG in ISPSoft, they can exchange the data with a device through the RS-485 serial control interface, and do not need to write any program.

11. High-speed Ethernet communication interface

- AHCPU500/501/510/511/520/521/530/531-EN and AHCPU521-DNP is equipped with a 10/100 M Ethernet communication interface, and supports emails, webs, and socket services.
- AH500 basic series CPU module (AHCPU500/510/520/530): After users set the PLC Link in NWCONIFG in ISPSoft, they can exchange the data with a device network through the Ethernet communication interface, and do not need to write any program.
- AH500 advanced series CPU module (AHCPU501/511/521/531 and AHCPU521-DNP): After users set in HWCONIFG or EIP Builder (for CPU module FW: V2.00.0 or later) in ISPSoft, they can exchange the data with a device through the Ethernet communication interface, and do not need to write any program.
- AH500 redundant series CPU module (AHCPU560-EN2): After users set in HWCONIFG or EIP Builder in ISPSoft, they can exchange the data with a device through the Ethernet communication interface, and do not need to write any program.
- The status or the error message related to the system is sent to users' email boxes immediately. Users do not need to be on the spot to understand the problem.

12. Memory card

- The memory card has the following functions.

  System backup: The user program, the CPU parameters, the module table, the setting value in the device

  System recovery: The user program, the CPU parameters, the module table, and the setting value in the device

  Parameter storage: The value in the device

  Log storage: The system error log and the system status log

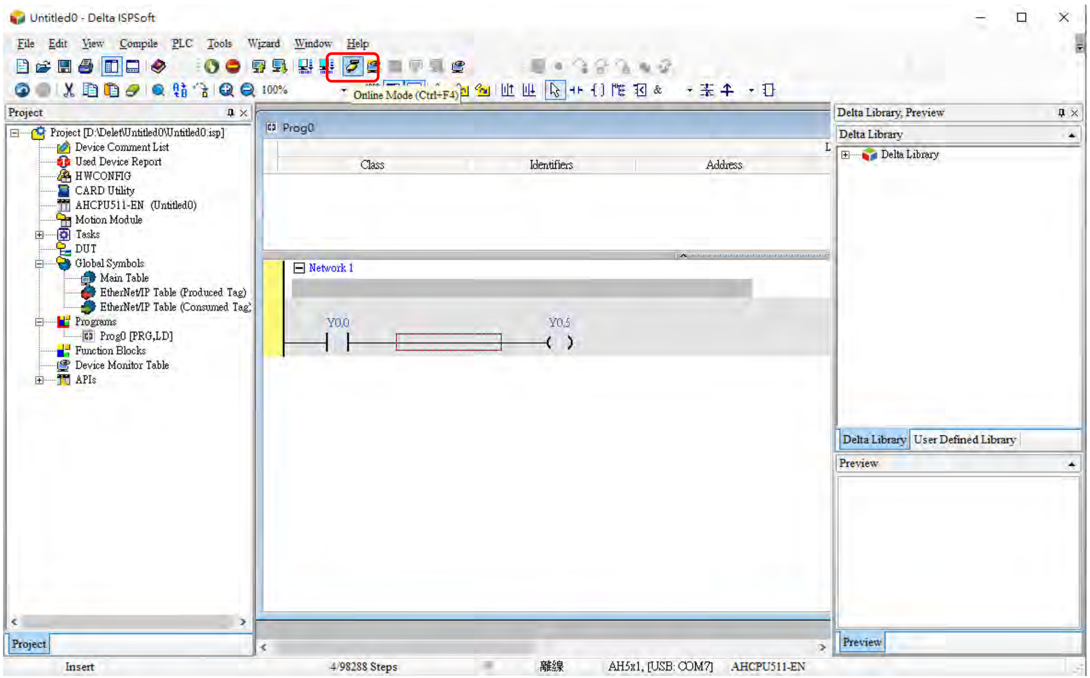
13. Hot swap

- The AH500 series I/O modules support the on-line uninterruptible hot swap. When the system runs, users can replace the module which breaks down without disconnecting the module. After the module is replaced, the new module runs normally. Users do not need to set the module manually or switch the state.

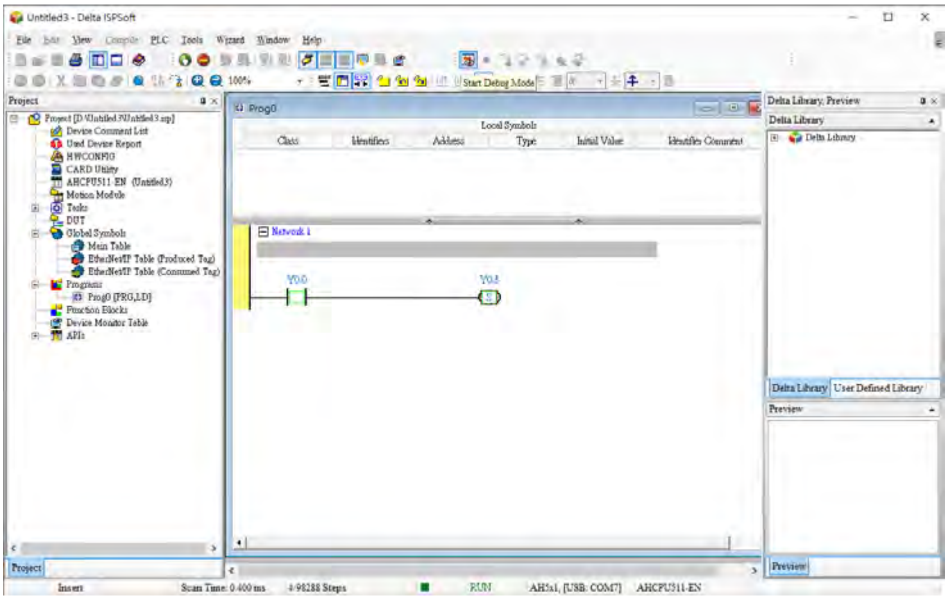
14. Supporting the on-line debugging mode

- After a single instruction step has been complete, or after a breakpoint is specified, users can easily find the bug in the program by means of the on-line debugging mode supported by the AH500 series CPU module.
- If users want to enter the debugging mode, the CPU module must run. After users enable the on-line monitoring function, they have to click . The debugging screen varies from programming language to programming language, but the same operation applies to these programming languages. For the AH500 series PLC, structured texts do not support the debugging mode, and sequential function charts support the debugging mode during the action and the transition.

Step 1: Entering the on-line mode

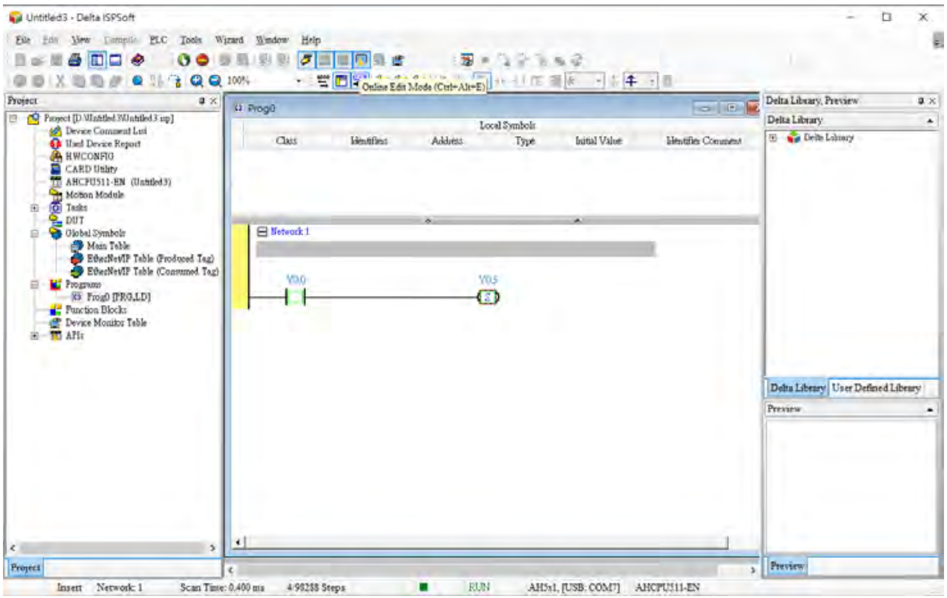


Step 2: Entering the debugging mode (PLC should be in the state of RUN)

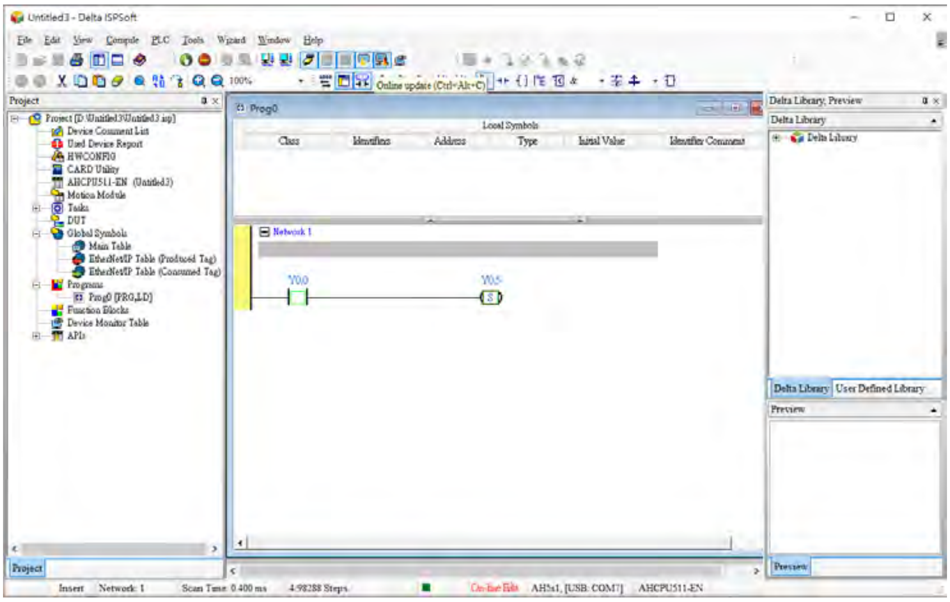


15. Supporting the on-line editing mode

- When the system runs, users can make use of the on-line editing mode to update the program without affecting the operation of the system.
- When the system is in the on-line monitoring mode, users can enter the on-line editing mode by clicking .



- After the program is modified and compiled, users can update the program in the CPU module by clicking .



Chapter 2 Specifications and System Configuration

2

Table of Contents

2

2.1 General Specifications

Item	Specifications
Operating temperature	-20~60°C
Storage temperature	-40~70°C
Operating humidity	5~95% No condensation
Storage humidity	5~95% No condensation
Ingress protection (IP ratings)	IP20
Vibration/Shock resistance	International standards IEC 61131-2, IEC 68-2-6 (TEST Fc)/ IEC 61131-2 & IEC 68-2-27 (TEST Ea)
Work environment	No corrosive gas exists.
Installation location	In a control box (indoor)
Pollution degree	2
Ambient air temperature-barometric pressure-altitude	Operating: 1080 ~ 795hPa (-1000 ~ 2000 m) Storage:1080 ~ 660hPa (-1000 ~ 3500 m)

2.2 Specifications for CPU Modules

2.2.1 AH500 Series Basic CPU Modules

Item	AHCPU500/510/520/530 -RS2	AHCPU500/510/520/530 -EN	Remark
Execution	The program is executed cyclically.		
Input/Output control	Regenerated inputs/outputs Direct inputs/outputs		The inputs and outputs can be controlled through the direct inputs and direct outputs.
Programming language	IEC 61131-3		
	Ladder diagrams, function block diagrams, instruction lists, structured texts, and sequential function charts		
Instruction execution speed	3K steps/ms		
Number of instructions	Approximately 666 instructions		
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)		By setting the parameter
Program capacity (step)	32K steps (AHCPU500) 64K steps (AHCPU510) 128K steps (AHCPU520) 256K steps (AHCPU530)		
Installation	DIN rails or screws		
Installation of a module	A module is installed directly on a backplane.		
Connection between two backplanes	An extension cable connects two backplanes.		
Maximum number of modules which can be installed	AHCPU500: 12 modules AHCPU510: 20 modules AHCPU520: 36 modules AHCPU530: 68 modules		
Maximum number of backplanes which can be connected	AHCPU500: 1 backplane (1 main backplane) AHCPU510: 2 backplanes (1 main backplane+1 extension backplane) AHCPU520: 4 backplanes (1 main backplane+3 extension backplanes) AHCPU530: 8 backplanes (1 main backplane+7 extension backplanes)		
Number of tasks	283 tasks (32 cyclic tasks; 32 I/O interrupts; 4 timed interrupts; 2 communication interrupts; 1 external 24 V low-voltage interrupt; 212 external interrupts)		
Number of inputs/outputs	AHCPU500: 768 AHCPU510: 1280 AHCPU520: 2304 AHCPU530: 4352		Number of inputs/outputs accessible to an actual input/output module
Input relays [X]	AHCPU500: 1024 (X0.0~X63.15) AHCPU510: 2048 (X0.0~X127.15) AHCPU520: 4096 (X0.0~X255.15) AHCPU530: 8192 (X0.0~X511.15)		
Output relays [Y]	AHCPU500: 1024 (Y0.0~Y63.15) AHCPU510: 2048 (Y0.0~Y127.15) AHCPU520: 4096 (Y0.0~Y255.15) AHCPU530: 8192 (Y0.0~Y511.15)		

Item	AHCPU500/510/520/530 -RS2	AHCPU500/510/520/530 -EN	Remark
Internal relays [M]	8192 (M0~M8191)		
Link registers [L]	AHCPU500: 16384 (L0~L16383) AHCPU510: 32768 (L0~L32767) AHCPU520: 65536 (L0~L65535) AHCPU530: 65536 (L0~L65535)		
Timers [T]	2048 (T0~T2047)		
Counters [C]	2048 (C0~C2047)		
32-bit counter [HC]	64 (HC0~HC63)		
Data register [D]	AHCPU500:16384 (D0~D16383) AHCPU510: 32768 (D0~D32767) AHCPU520: 65536 (D0~D65535) AHCPU530: 65536 (D0~D65535)		
Stepping relay [S]	2048 (S0~S2047)		
Index register [E]	32 (E0~E31)		
Special auxiliary relay [SM]	2048 (SM0~SM2047)		
Special data register [SR]	2048 (SR0~SR2047)		
Serial communication port	Two RS-232/RS-485/RS-422 communication ports	One RS-232/RS-485/RS-422 communication port	
MODBUS TCP connection number (Server)	-	32	
MODBUS TCP connection number (Client)	-	AHCPU500-EN: 16 AHCPU510-EN: 32 AHCPU520-EN: 64 AHCPU530-EN: 128	
Socket TCP connecton number	-	8	
Socket UDP connection number	-	8	
SMTP connection number	-	8	
USB port	Mini USB		
Storage interface	SD Card (SD 1.0)		
Remote RUN/STOP	The setting range is X0.0~X511.15.		
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks; real-time clock can be retained after power-off for up to 30 days (the environment temperature 25 ºC / 77 ºF)		
Real-time clock accuracy	Maximum deviation per month -20ºC / -4ºF: -117 seconds 25 ºC / 77 ºF: 52 seconds 60 ºC / 140 ºF: -127 seconds		
Weight	266g	260g	
Communication port isolation	COM1 and COM2 ports: 500 VAC	COM1 and COM2 ports: 500 VAC Ethernet: 1500 VAC	

2.2.2 AH500 Series Advanced CPU Modules

<table>
<tr><th>Item</th><th>AHCPU501/511/521/531-RS2</th><th>AHCPU501/511/521/531-EN and AHCPU521-DNP</th><th>Remark</th></tr>
<tr><td>Execution</td><td colspan="2">The program is executed cyclically.</td><td></td></tr>
<tr><td>Input/Output control</td><td colspan="2">Regenerated inputs/outputs
Direct inputs/outputs</td><td>The inputs and outputs can be controlled through the direct inputs and direct outputs.</td></tr>
<tr><td rowspan="2">Programming language</td><td colspan="2">IEC 61131-3</td><td></td></tr>
<tr><td colspan="2">Ladder diagrams, function block diagrams, instruction lists, structured texts, and sequential function charts</td><td></td></tr>
<tr><td>Instruction execution speed</td><td colspan="2">12K steps/ms</td><td></td></tr>
<tr><td>Number of instructions</td><td colspan="2">Approximately 666 instructions</td><td></td></tr>
<tr><td>Constant scan cycle (ms)</td><td colspan="2">1-32000
(The scan cycle can be increased by one millisecond.)</td><td>Setting the parameter</td></tr>
<tr><td>Program capacity (step)</td><td colspan="2">AHCPU501: 48 steps
AHCPU511: 96K steps
AHCPU521: 192K steps
AHCPU531: 384K steps</td><td></td></tr>
<tr><td>Installation</td><td colspan="2">DIN rails or screws</td><td></td></tr>
<tr><td>Installation of a module</td><td colspan="2">A module is installed directly on a backplane.</td><td></td></tr>
<tr><td>Connection between two backplanes</td><td colspan="2">An extension cable connects two backplanes.</td><td></td></tr>
<tr><td>Maximum number of modules which can be installed</td><td colspan="2">AHCPU501: 12 modules
AHCPU511: 20 modules
AHCPU521: 36 modules
AHCPU531: 68 modules</td><td></td></tr>
<tr><td>Maximum number of backplanes which can be connected</td><td colspan="2">AHCPU501: 1 main backplane
AHCPU511: 2 backplane (1 main backplane+1 extension backplane)
AHCPU521: 4 backplanes (1 main backplane+3 extension backplane)
AHCPU531: 8 backplanes (1 main backplane+7 extension backplanes)</td><td></td></tr>
<tr><td>Number of tasks</td><td colspan="2">283 tasks (32 cyclic tasks; 32 I/O interrupts; 4 timed interrupts; 2 communication interrupts; 1 external 24 V low-voltage interrupt; 212 external interrupts)</td><td></td></tr>
<tr><td>Number of inputs/outputs</td><td colspan="2">AHCPU501: 768
AHCPU511: 1280
AHCPU521: 2304
AHCPU531: 4352</td><td>Number of inputs/outputs accessible to an actual input/output module</td></tr>
<tr><td>Input relays [X]</td><td colspan="2">AHCPU501: 2048 (X0.0~X127.15)
AHCPU511: 4096 (X0.0~X255.15)
AHCPU521: 8192 (X0.0~X511.15)
AHCPU531: 16384 (X0.0~X1023.15)</td><td></td></tr>
<tr><td>Output relays [Y]</td><td colspan="2">AHCPU501: 2048 (Y0.0~X127.15)
AHCPU511: 4096 (Y0.0~Y255.15)
AHCPU521: 8192 (Y0.0~Y511.15)
AHCPU531: 16384 (Y0.0~Y1023.15)</td><td></td></tr>
<tr><td>Internal relays [M]</td><td colspan="2">8192 (M0~M8191)</td><td></td></tr>
</table>

Item	AHCPU501/511/521/ 531-RS2	AHCPU501/511/521/ 531-EN and AHCPU521-DNP	Remark
Link registers [L]	AHCPU501: 24576 (L0~L24575) AHCPU511: 49152 (L0~L49151) AHCPU521: 98304 (L0~L98303) AHCPU531: 131072 (L0~L131071)		
Timers [T]	2048 (T0~T2047)		
Counters [C]	2048 (C0~C2047)		
32-bit counter [HC]	64 (HC0~HC63)		
Data register [D]	AHCPU501: 24576 (D0~D24575) AHCPU511: 49152 (D0~D49151) AHCPU521: 98304 (D0~D98303) AHCPU531: 131072 (D0~D131071)		
Stepping relay [S]	2048 (S0~S2047)		
Index register [E]	32 (E0~E31)		
Special auxiliary relay [SM]	4096 (SM0~SM4095)		
Special data register [SR]	4096 (SR0~SR4095)		
Serial communication port	Two RS-232/RS-485/RS-422 communication ports	One RS-232/RS-485/RS-422 communication port	
Ethernet port	-	10/100 M	
MODBUS TCP connection number (Server)	-	32 For FW V2.02 or later: AHCPU501-EN：48 AHCPU511-EN：64 AHCPU521-EN：96 AHCPU521-DNP：96 AHCPU531-EN：160	
MODBUS TCP connection number (Client)	-	AHCPU501-EN: 16 AHCPU511-EN: 32 AHCPU521-EN: 64 AHCPU521-DNP: 64 AHCPU531-EN: 128	
Socket TCP connecton number	-	8	
Socket UDP connection number	-	8	
SMTP connection number	-	8	
USB port	Mini USB		
Storage interface	SD Card (SD 1.0)		
Remote RUN/STOP	The setting range is X0.0~X511.15.		
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks; real-time clock can be retained after power-off for up to 30 days (the environment temperature 25 ºC / 77 ºF)		
Real-time clock accuracy	Maximum deviation per month -20ºC / -4ºF: -117 seconds 25 ºC / 77 ºF: 52 seconds 60 ºC / 140 ºF: -127 seconds		
Weight	253g	252g	
Communication port isolation	COM1 and COM2 ports: 500 VAC	COM1 and COM2 ports: 500 VAC Ethernet: 1500 VAC	

2.2.3 AH500 Redundancy CPU Module Specification

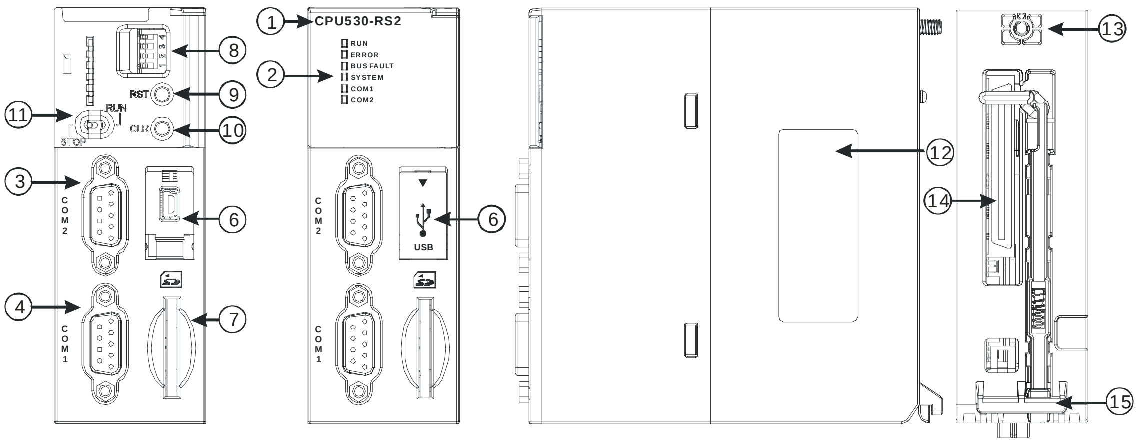
Item	AHCPU560-EN2	Remark
Execution	The program is executed cyclically.	
Input/Output control	Regenerated inputs/outputs Direct inputs/outputs	The inputs and outputs can be controlled through the direct inputs and direct outputs.
Programming language	IEC 61131-3	
	Ladder diagrams, function block diagrams, instruction lists, structured texts, and sequential function charts	
Instruction execution speed	12K steps/ms	
Number of instructions	Approximately 666 instructions	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)	By setting the parameter
Program capacity (step)	1M Steps	
Installation	DIN rails or screws	
Installation of a module	A module is installed directly on a backplane.	
Connection between two backplanes	An extension cable connects two backplanes.	
Maximum number of modules which can be installed	64	
Maximum number of backplanes which can be connected	8	
Number of tasks	Single mode: 283 tasks (32 cyclic tasks; 32 I/O interrupts; 4 timed interrupts; 2 communication interrupts; 1 external 24 V low-voltage interrupt; 212 external interrupts) Redundant mode: 36 tasks (32 cyclic tasks; 4 timed interrupts)	
Number of inputs/outputs	Single mode: 4352 Redundant mode: 3584	For I/O module
Input relays [X]	65536 (X0.0-X4095.15)	
Output relays [Y]	65536 (Y0.0-Y4095.15)	
Internal relays [M]	8192 (M0-M8191)	
Link registers [L]	262144 (L0-L262143)	
Timers [T]	2048 (T0-T2047)	
Counters [C]	2048 (C0-C2047)	
32-bit counter [HC]	64 (HC0-HC63)	
Data register [D]	262144 (D0-D262143)	
Stepping relay [S]	4096 (S0-S4095)	
Index register [E]	32 (E0-E31)	
Special auxiliary relay [SM]	4096 (SM0-SM4095)	
Special data register [SR]	4096 (SR0-SR4095)	
Serial communication port	1 port: RS-232/485	
Ethernet port	10/100M	
MODBUS TCP connection number (Slave)	160	

Item	AHCPU560-EN2	Remark
MODBUS TCP connection number (Master)	128	
USB port	Mini USB	
Storage interface	Micro SD	
Remote RUN/STOP	The setting range is X0.0~X511.15.	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks; real-time clock can be retained after power-off for up to 30 days (the environment temperature 25 ºC / 77 ºF)	
Real-time clock accuracy	Maximum deviation per month -20ºC / -4ºF: -117 seconds 25 ºC / 77 ºF: 52 seconds 60 ºC / 140 ºF: -127 seconds	
Switchover Time	For modules on extension backplane: under 20 ms For remote I/O modules (Master CPU controls): under 2 s	
Synchronization speed	0.5 ms / kbyte	
Weight	265g	
Communication port isolation	USB and COM ports: 500 VAC Ethernet: 1500 VAC	

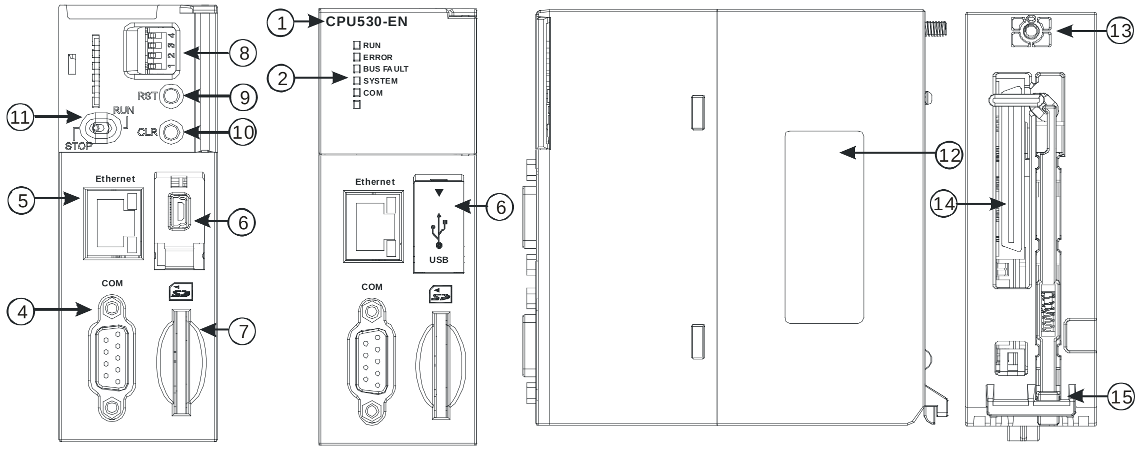
2.2.4 Profiles

2.2.4.1 AH500 Basic/Advanced CPU modules

- **AHCPU5X0-RS2 (AHCPU500-RS2/AHCPU510-RS2/AHCPU520-RS2/AHCPU530-RS2), AHCPU5X1-RS2 (AHCPU501-RS2/AHCPU511-RS2/AHCPU521-RS2/AHCPU531-RS2) Built-in communication ports*2 (RS-232 and RS-422/485)**



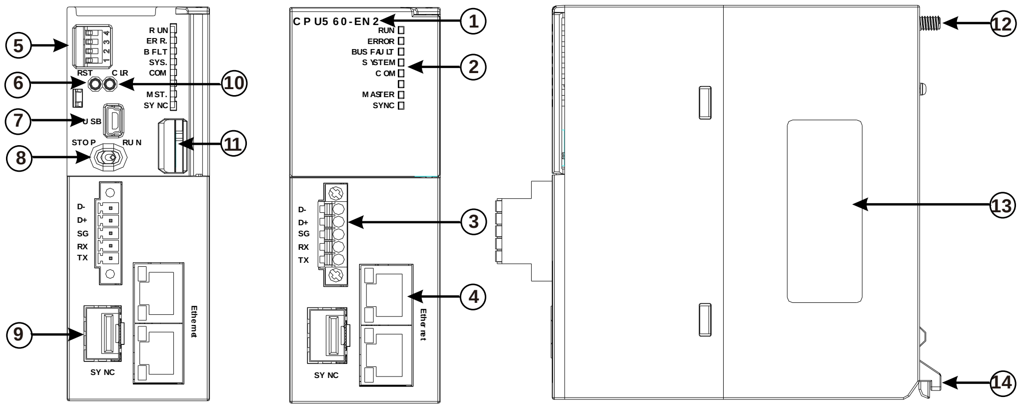
- **AHCPU5X0-EN (AHCPU500-EN/AHCPU510-EN/AHCPU520-EN/AHCPU530-EN), AHCPU5X1-EN (AHCPU501-EN/AHCPU511-EN/AHCPU521-EN/AHCPU531-EN) and AHCPU521-DNP Built-in communication ports*3 (USB port, RS-232, RS-422/485 and Ethernet port)**



Number	Name	Description
1	Model name	Model name of the CPU module
2	RUN LED indicator	Operating status of the CPU module ON: The user program is being executed. OFF: The execution of the user program stops. Blinking: The user program is in a debugging mode.
	ERROR LED indicator	Error status of the CPU module ON: A serious error occurs in the system. OFF: The system is normal. Blinking: A slight error occurs in the system.
	BUS FAULT LED indicator	Error status of the I/O bus ON: A serious error occurs in the I/O bus. OFF: The I/O bus is normal. Blinking: A slight error occurs in the I/O bus.
2	SYSTEM LED indicator	System status of the CPU module ON: The external input/output is forced ON/OFF. OFF: The system is in a default status. Blinking: The CPU module is being reset./The value in the device is being cleared.
	COM LED indicator COM1 LED indicator COM2 LED indicator	Communication status of the communication port OFF: There is no communication through the communication port. Blinking: There is communication through the communication port.
3	COM2	Providing the RS-232/RS-485/RS-422 communication interface
4	COM1/COM	Providing the RS-232/RS-485/RS-422 communication interface
5	Ethernet port	Providing the Ethernet communication interface
6	USB port	Providing the mini USB communication interface
7	SD slot	Providing the SD interface
8	DIP switch	Function which the system executes
		SW1: OFF: No action (default) ON: Write protection
		SW2: OFF: No action (default) ON: The system is restored when the CPU module is supplied with powered. (The user program, the CPU paramter, the module table, and the setting values in the devices are restored from the memory card to the CPU module.)
		SW3: OFF: No action (default) ON: It is used with the CLR button to backup the system.

Number	Name	Description	
			(The user program, the CPU paramter, the module table, and the setting values in the devices are backupped from the memory card to the CPU module.)
		SW4	It is used with SW3. OFF: When the system is backupped, the values in the devices are backupped. ON: When the system is backupped, the values in the devices are not backupped.
9	RST button	Resetting the CPU module, and restoring it to the default factory value	
10	CLR button	Clearing the value in the latched device	
11	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.	
12	Label	Nameplate	
13	Set screw	Fixing the module	
14	Connector	Connecting the module and a backplane.	
15	Projection	Fixing the module	

2.2.4.2 AH500 Redundant CPU Modules

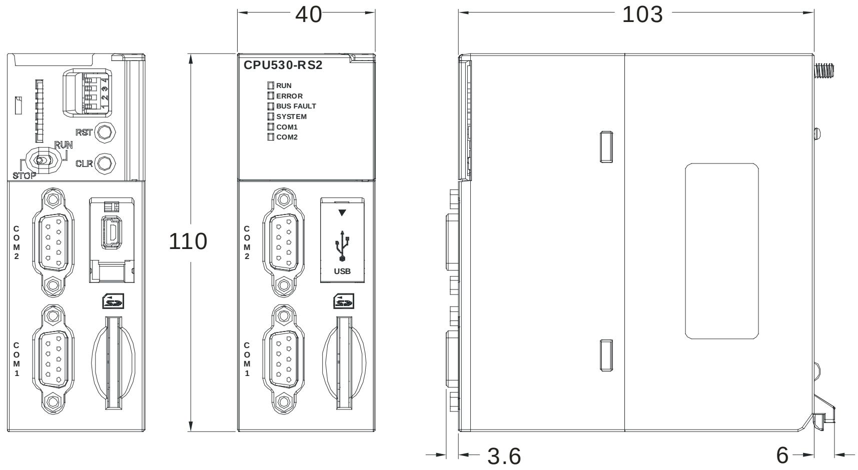


Number	Name	Description
1	Model name	Shows the model name of the CPU module.
2	Run/Stop LED	Operating status of the CPU ON: the module is running OFF: the module stops Blinking: the program is checking if there is any error
	Error LED	Indicates CPU error ON: a serious error occurs in the module. OFF: the module is normal. Blinking: a minor error occurs in the module.
	Bus Fault LED	Indicates I/O Bus error ON: a serious error occurs in the I/O Bus. OFF: the I/O Bus is normal. Blinking: a minor error occurs in the I/O Bus.
	SYSTEM LED	Indicates the system status of the CPU ON: external I/O is locked OFF: system in default Blinking: reset/clear
	COM LED	Indicates the communication status of the COM port. OFF: no communication over the COM port Blinking: communication over the COM port

<table>
<tr><th>Number</th><th>Name</th><th colspan="2">Description</th></tr>
<tr><td rowspan="2"></td><td>MASTER LED</td><td colspan="2">Indicates the system is in redundant mode
ON: Master CPU in redundant mode
OFF: Standby CPU in redundant mode / single mode</td></tr>
<tr><td>SYNC LED</td><td colspan="2">Indicates the synchronization status of the redundancy system
ON (Green): in synchronization mode
Blinking (Orange): identification check
ON (Red): fiber disconnected
Blinking (Red): identification check failed
OFF: single mode</td></tr>
<tr><td>3</td><td>COM port</td><td colspan="2">Provides an interface for RS-232/RS-485 communication</td></tr>
<tr><td>4</td><td>Ethernet port</td><td colspan="2">Provides an interface for a n Ethernet communication, supports EtherNet/IP and MODBUS TCP protocols</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">DIP switch</td><td colspan="2">Sets the executing items</td></tr>
<tr><td>SW1</td><td>OFF: no action (default)
ON: written protection</td></tr>
<tr><td>SW2</td><td>OFF: no action (default)
ON: when power-on, it copies programs, CPU parameters, I/O configurations, device setting values from SD card to CPU module</td></tr>
<tr><td>SW3</td><td>OFF: no action (default)
ON: works with clear button and it backups programs, CPU parameters, I/O configurations, device setting values from CPU module to SD card.</td></tr>
<tr><td>SW4</td><td>Works with SW3
OFF: system backups (device contents are included)
ON: system backups (device contents are excluded)</td></tr>
<tr><td>6</td><td>RST button</td><td colspan="2">Resets CPU module to factory defaults
Note: after the CPU module is rest, the ERROR LED will be ON and error code is 16#1402. You need to set the I/O configurations again via HWCONFIG of ISPSoft to have the PLC function normally.</td></tr>
<tr><td>7</td><td>USB port</td><td colspan="2">Mini USB communication port</td></tr>
<tr><td>8</td><td>RUN/STOP</td><td colspan="2">RUN: execute the programs
STOP: stop the programs</td></tr>
<tr><td>9</td><td>Fiber communication port</td><td colspan="2">For data synchronization</td></tr>
<tr><td>10</td><td>CLR button</td><td colspan="2">Clears data from the latched area</td></tr>
<tr><td>11</td><td>SD card slot</td><td colspan="2">Provides an interface for an SD card</td></tr>
<tr><td>12</td><td>Set screw</td><td colspan="2">Fixes the base</td></tr>
<tr><td>13</td><td>Label</td><td colspan="2">Nameplate</td></tr>
<tr><td>14</td><td>Module connecting set</td><td colspan="2">Fixing a module</td></tr>
</table>

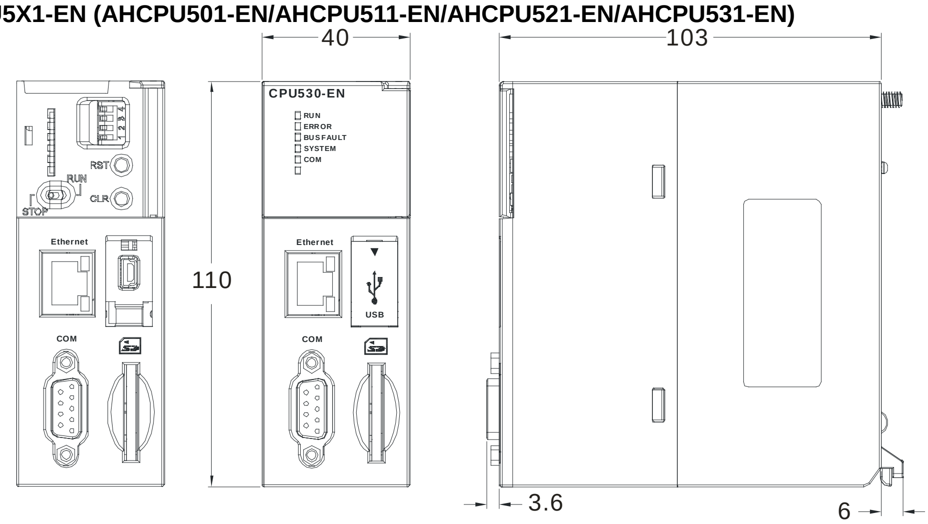
2.2.5 Dimensions

- **AHCPU5X0-RS2 (AHCPU500-RS2/AHCPU510-RS2/AHCPU520-RS2/AHCPU530-RS2), AHCPU5X1-RS2 (AHCPU501-RS2/AHCPU511-RS2/AHCPU521-RS2/AHCPU531-RS2) and AHCPU521-DNP**



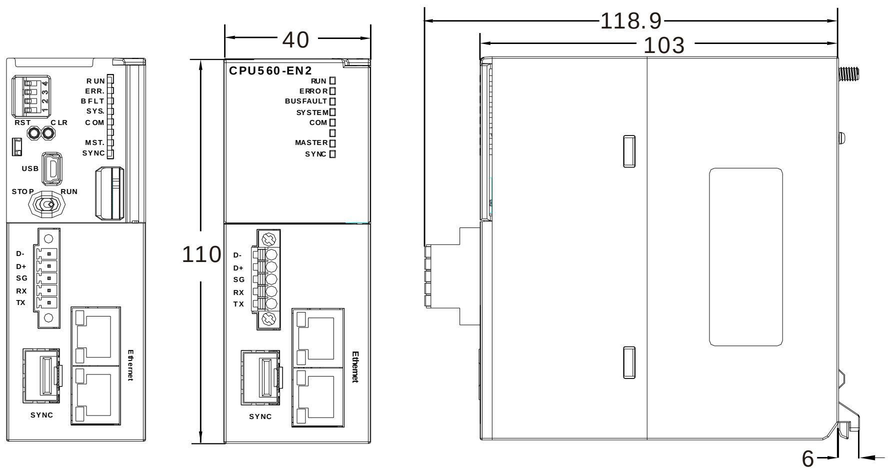
Unit: mm

- **AHCPU5X0-EN (AHCPU500-EN/AHCPU510-EN/AHCPU520-EN/AHCPU530-EN), AHCPU5X1-EN (AHCPU501-EN/AHCPU511-EN/AHCPU521-EN/AHCPU531-EN)**



Unit: mm

- **AHCPU560-EN2**



Unit: mm

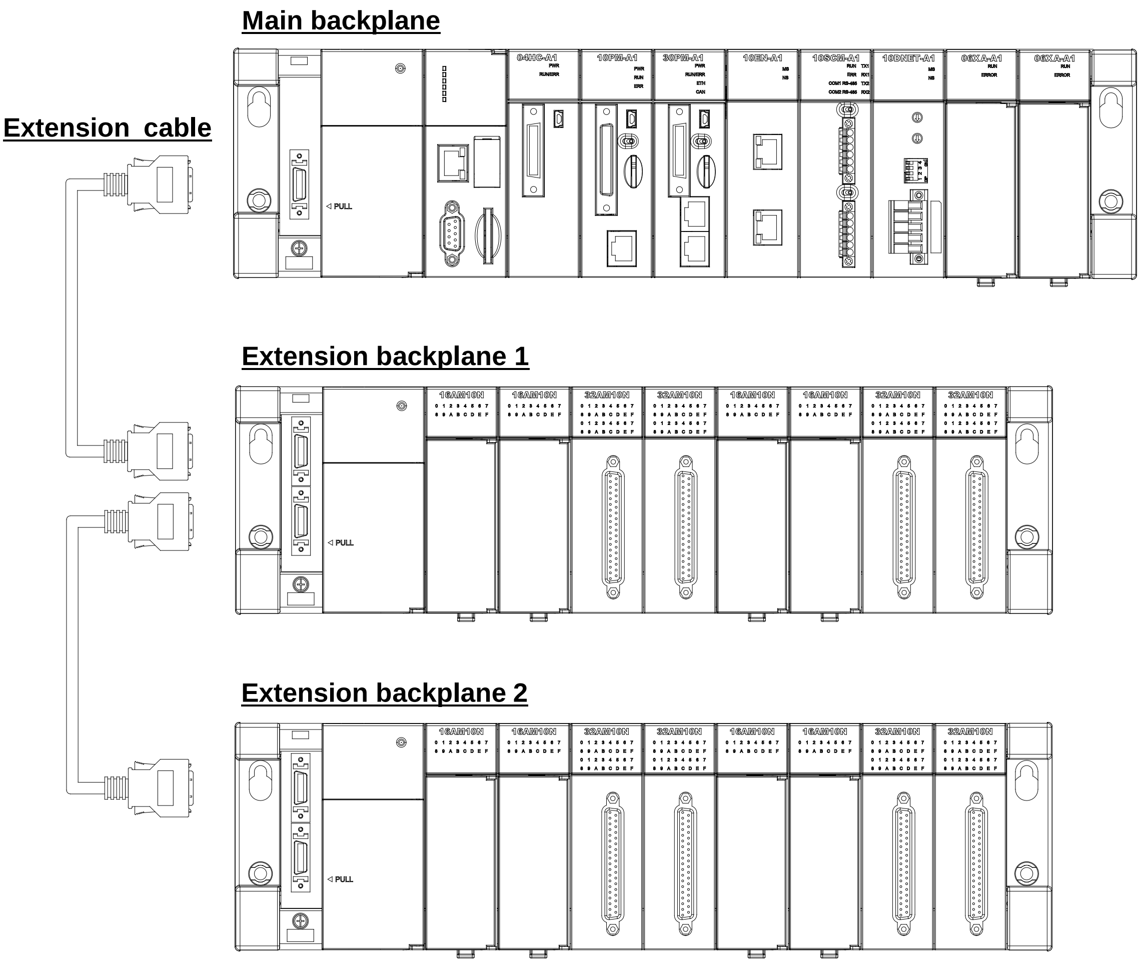
2.3 Basic System Configuration

2.3.1 Introduction

The AH500 system configuration is composed of a CPU module, power supply modules, digital input/output modules, analog input/output modules, temperature measurement modules, network modules, motion control modules, a main backplane, extension cables, and extension backplanes. Besides, an SD card is optionally used.

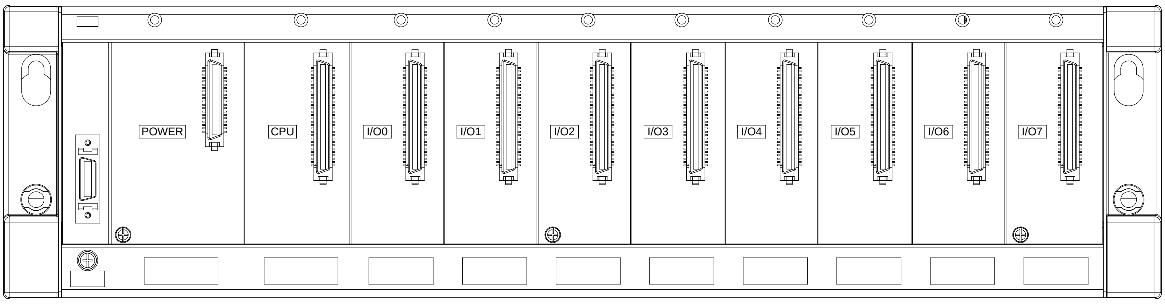
A main backplane can be connected to an extension backplane through the interface on the left side of the main backplane, the interface on the left side of the extension backplane, and a Delta extension cable. For a CPU module or a RTU, a main backplane can be connected to seven extension backplanes at most through the interfaces on the backplanes. Therefore, if there is a CPU module and there are several RTUs, not only the CPU module can be connected to seven extension backplanes, but also every RTU can connect to seven extension backplanes.

There are two ports on an extension backplane. The upper port is used to connect to a superior backplane, and the lower port is used to connect to an inferior backplane.



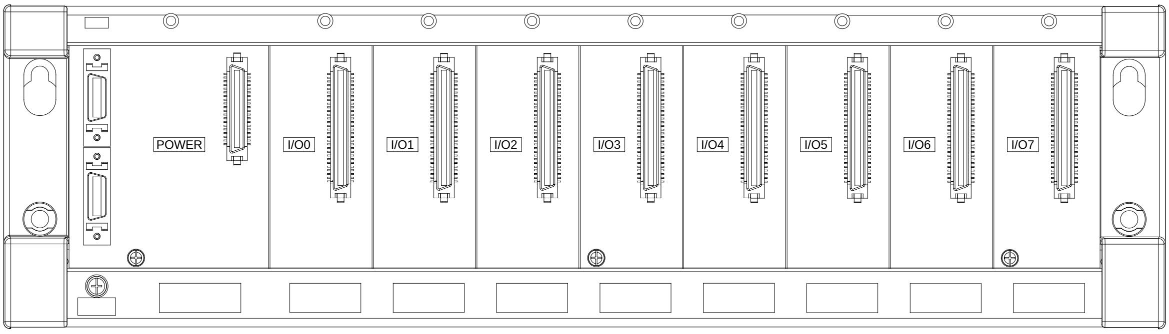
2.3.2 Configuring a Main Backplane

A CPU module, a power supply module, and I/O modules are installed on a main backplane. Twelve I/O modules at most can be installed on a main backplane.



2.3.3 Configuring an Extension Backplane

An extension backplane can be connected to a main backplane to increase the number of I/O modules. Eight I/O modules at most can be installed on an extension cable, and seven extension backplanes at most can be connected to a main backplane.



2.3.4 Maximum Extension

Twelve I/O modules at most can be installed on a main backplane. (There are four types of main backplanes. These four types are four-slot main backplanes, six-slot main backplanes, eight-slot main backplanes, and twelve-slot main backplanes.) Eight I/O modules at most can be installed on an extension backplane, and seven extension backplanes at most can be connected to a main backplane. (There are two types of extension backplanes. These two types are six-slot extension backplanes, and eight-slot extension backplanes.) Sixty-eight I/O modules at most can be installed on backplanes. Eight AH10EN-5A modules at most can be installed on a main backplane, and eight AH10DNET-5A modules at most can be installed on a main backplane. The other I/O modules can be installed on a main backplane unlimitedly. Besides, digital input/output modules, analog input/output modules, temperature measurement modules, and AHSCM-5A modules can be installed on an extension backplane. The other I/O modules can not be installed on an extension backplane.

Extension	Maximum Extension	Description
A main backplane is connected to extension backplanes	One main backplane and seven extension backplanes (There are four types of main backplanes. These four types are four-slot main backplanes, six-slot main backplanes, eight-slot main backplanes, and twelve-slot main backplanes. There are two types of extension backplanes. These two types are six-slot extension backplanes, and eight-slot extension backplanes.)	Sixty-eight (64 = 12+8*7) I/O modules at most can be installed on backplanes.

- AH500 system configuration

Configuration	Description
Main backplane	There is one main backplane in an AH500 system. Four-slot main backplane: AHBP04M1-5A Six-slot main backplane: AHBP06M1-5A Eight-slot main backplane: AHBP08M1-5A Twelve-slot main backplane: AHBP12M1-5A
Extension backplane	There are seven extension backplanes at most in an AH500 system. Six-slot extension backplanes: AHBP06E1-5A Eight-slot extension backplanes: AHBP08E1-5A
Extension cable	There are four types of lengths. AHACAB06-5: 60 cm AHACAB10-5A: 1 m AHACAB15-5A: 1.5 m AHACAB30-5A: 3 m
Power supply module	Every backplane needs a power supply module. AHPS05-5A: 85 V to 264 V and 5 A (only used for backplane power supply.)
CPU module	There is one CPU module in an AH500 system, such as AHCPU5X0-RS2, AHCPU5X0-EN, AHCPU5X1-RS2, AHCPU5X1-EN and AHCPU521-DNP.
Digital I/O module	Unlimited number of digital I/O modules, analog I/O modules, and temperature measurement modules can be installed in an AH500 system.
Analog I/O module	
Temperature measurement module	
Motion control module	Motion control modules can only be installed on a main backplane.
Network module	Network modules (maximum: 8) can only be installed on a main backplane. Unlimited number of AHSCM-5A modules can be installed on a main backplane.

2.4 Specifications for Backplanes

2.4.1 General Specifications

- **Specifications for main backplanes**

Model / Item	AHBP04M1-5A	AHBP06M1-5A	AHBP08M1-5A	AHBP12M1-5A
Number of slots	4	6	8	12
Applicable power supply module	AHPS05-5A and AHPS15-5A			
Applicable input/output module	The AH500 series input/output modules can be installed.			
Weight	473g	587g	688g	918g

- **Specifications for extension backplanes**

Model / Item	AHBP06E1-5A	AHBP08E1-5A
Number of slots	6	8
Applicable power supply module	AHPS05-5A and AHPS15-5A	
Applicable input/output module	Digital input/output modules, analog input/output modules, temperature measurement module, and AH10SCM-5A/AH15SCM-5A	
Weight	532g	649g

- **Specifications for redundant main backplanes**

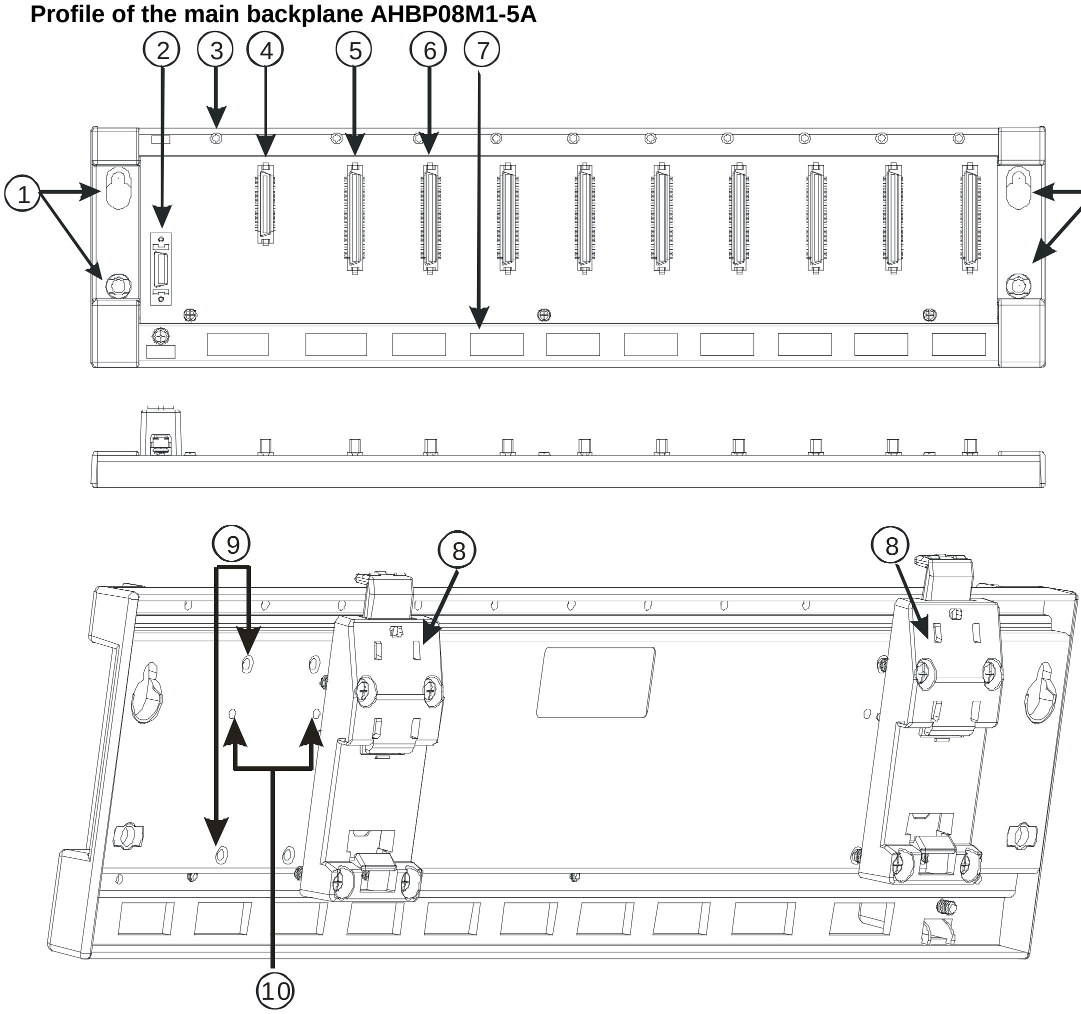
Item \ Model	AHBP04MR1-5A	AHBP06MR1-5A	AHBP08MR1-5A
Number of slots	4	6	8
Applicable power supply module	AHPS05-5A and AHPS15-5A		
Applicable input/output module	AH10EN-5A, AH15EN-5A, AH10SCM-5A, AH15SCM-5A		
Weight	557g	668g	780g

- **Specifications for redundant extension backplanes**

Item \ Model	AHBP06ER1-5A	AHBP08ER1-5A
Number of slots	6	8
Applicable power supply module	AHPS05-5A and AHPS15-5A	
Applicable input/output module	Digital input/output modules, analog input/output modules, temperature measurement module, and AH10SCM-5A/AH15SCM-5A	
Weight	660g	784g

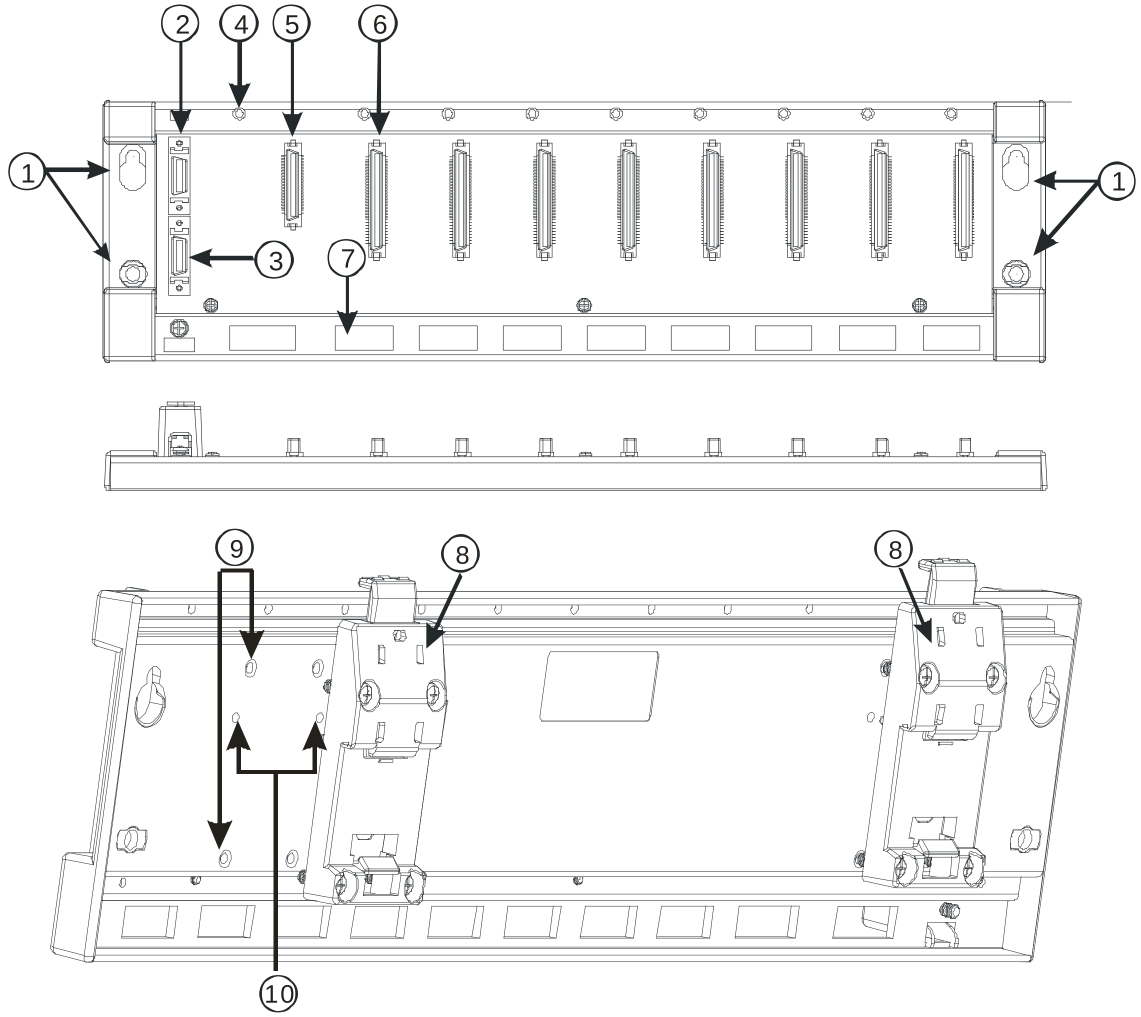
2.4.2 Profiles

- **Profile of the main backplane AHBP08M1-5A**



Number	Name	Description
1	Mounting hole	Fixing the backplane
2	Extension port	It is connected to an inferior backplane.
3	Mounting hole	After a module is installed, it is fixed by a screw.
4	Connector	Connecting the backplane and a power supply module
5	Connector	Connecting the backplane and a CPU module
6	Connector	Connecting the backplane and an input/output module
7	Hole	The projection under a module is inserted into this hole.
8	Mounting clip	Hanging a backplane on a DIN rail
9	Mounting hole	After a mounting clip is installed, it is fixed by screws.
10	Locating hole	A mounting clip is pressed into these locating holes.

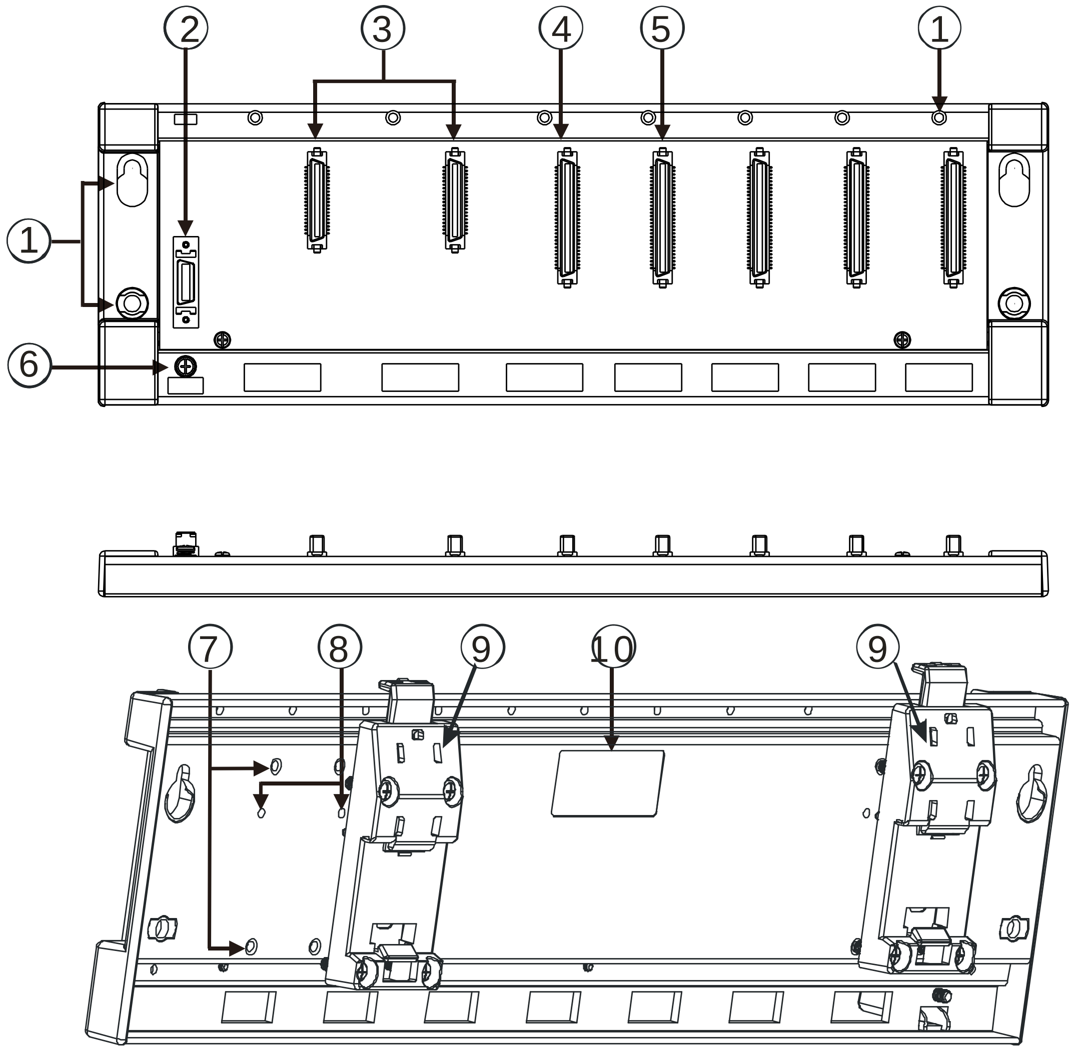
- **Profile of the extension backplane AHBP08E1-5A**



Number	Name	Description
1	Mounting hole	Fixing the backplane
2	Extension port 1	It is connected to a superior backplane.
3	Extension port 2	It is connected to an inferior backplane.
4	Connector	Connecting the backplane and a power supply module
5	Connector	Connecting the backplane and an input/output module
6	Mounting hole	After a module is installed, it is fixed by a screw.
7	Hole	The projection under a module is inserted into this hole.
8	Mounting clip	Hanging a backplane on a DIN rail
9	Mounting hole	After a mounting clip is installed, it is fixed by screws.

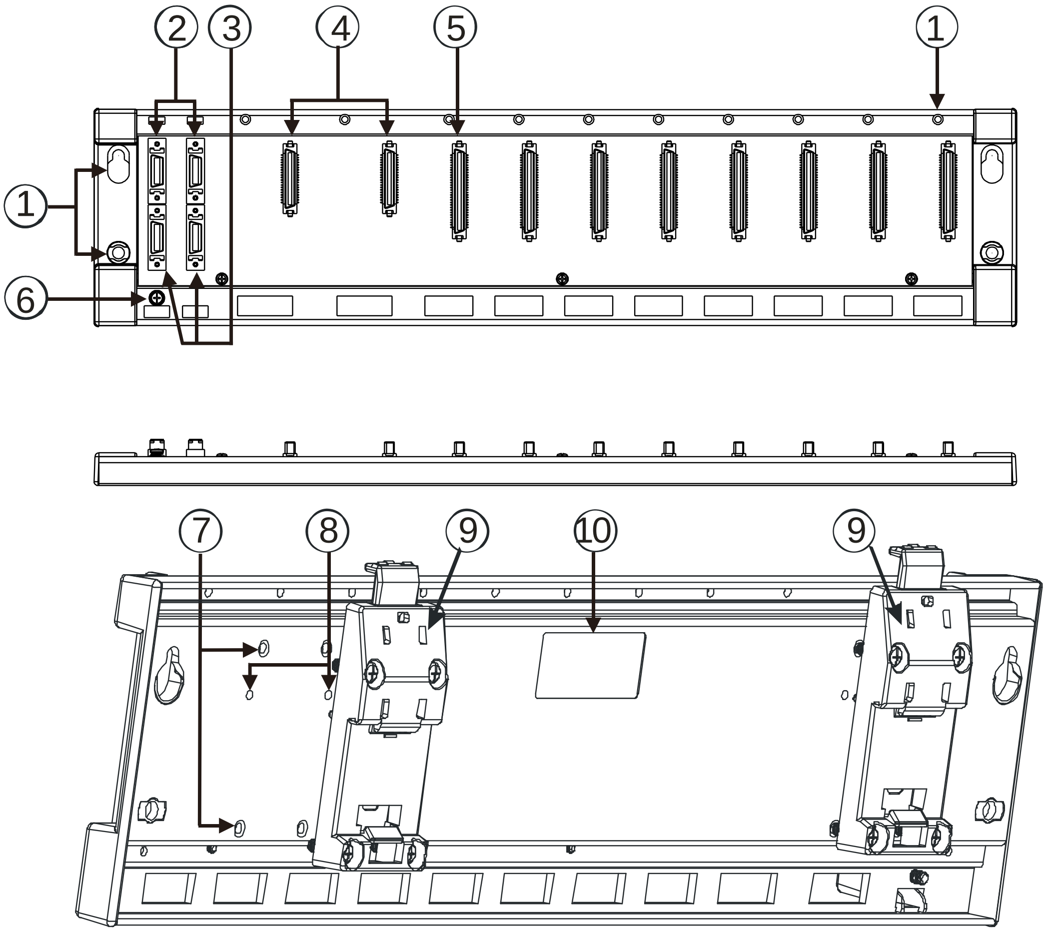
Number	Name	Description
10	Locating hole	A mounting clip is pressed into these locating holes.

- **Profile of the redundant main backplane AHBP04MR1-5A**



Number	Name	Description
1	Mounting hole	Fixing the backplane
2	Extension port 1	It is connected to a superior backplane.
3	Extension port 2	It is connected to an inferior backplane.
4	Connector	Connecting the backplane and a power supply module
5	Connector	Connecting the backplane and an input/output module
6	Mounting hole	After a module is installed, it is fixed by a screw.
7	Hole	The projection under a module is inserted into this hole.
8	Mounting clip	Hanging a backplane on a DIN rail
9	Mounting hole	After a mounting clip is installed, it is fixed by screws.
10	Locating hole	A mounting clip is pressed into these locating holes.

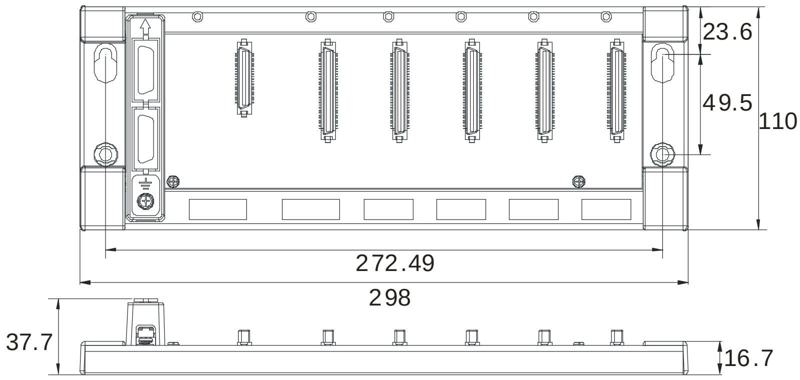
- **Profile of the redundant extension backplane AHBP08ER1-5A**



Number	Name	Description
1	Mounting hole	Fixing the backplane
2	Extension port 1	It is connected to a superior backplane.
3	Extension port 2	It is connected to an inferior backplane.
4	Connector	Connecting the backplane and a power supply module
5	Connector	Connecting the backplane and an input/output module
6	Mounting hole	After a module is installed, it is fixed by a screw.
7	Hole	The projection under a module is inserted into this hole.
8	Mounting clip	Hanging a backplane on a DIN rail
9	Mounting hole	After a mounting clip is installed, it is fixed by screws.
10	Locating hole	A mounting clip is pressed into these locating holes.

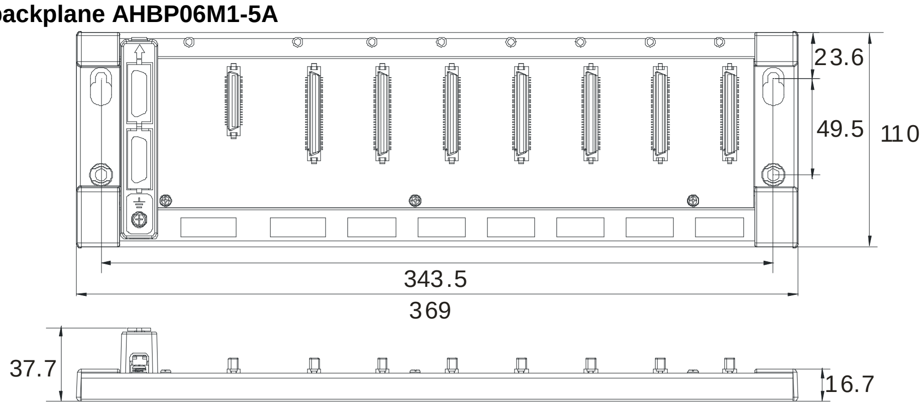
2.4.3 Dimensions

- **Main backplane AHBP04M1-5A**



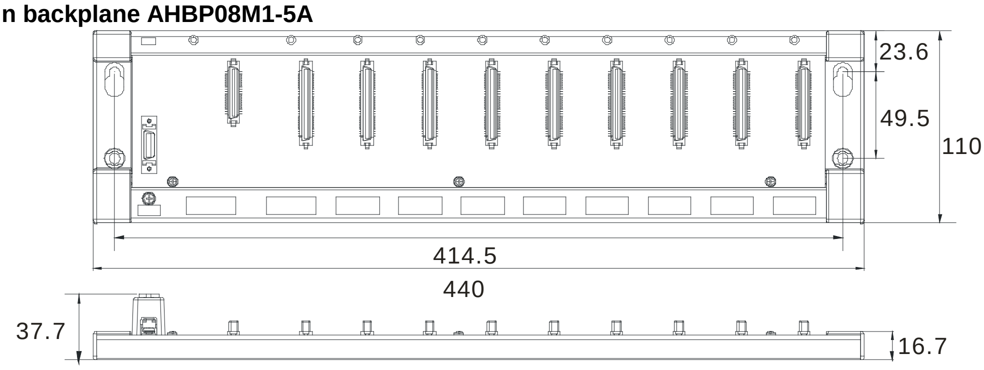
Unit: mm

- **Main backplane AHBP06M1-5A**



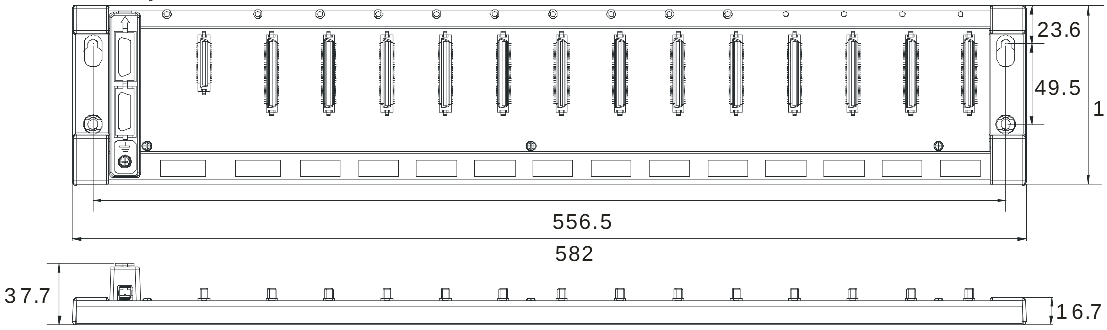
Unit: mm

- **Main backplane AHBP08M1-5A**



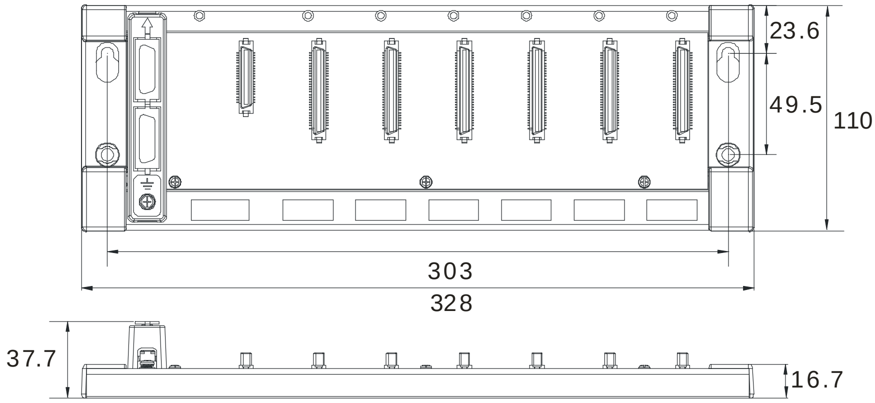
Unit: mm

- **Main backplane AHBP12M1-5A**



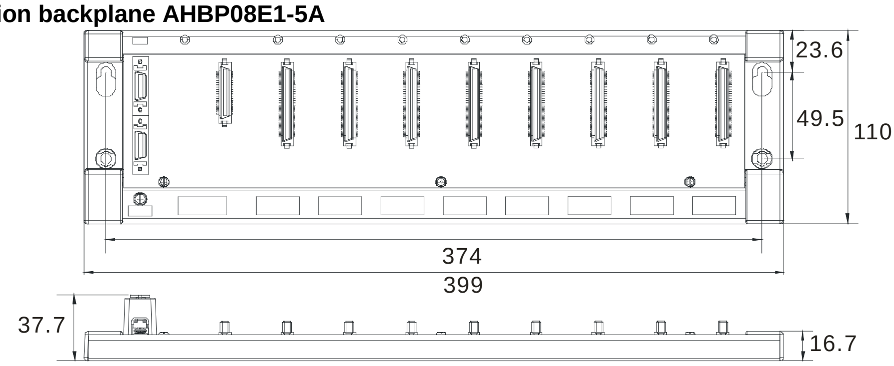
Unit: mm

- **Extension backplane AHBP06E1-5A**



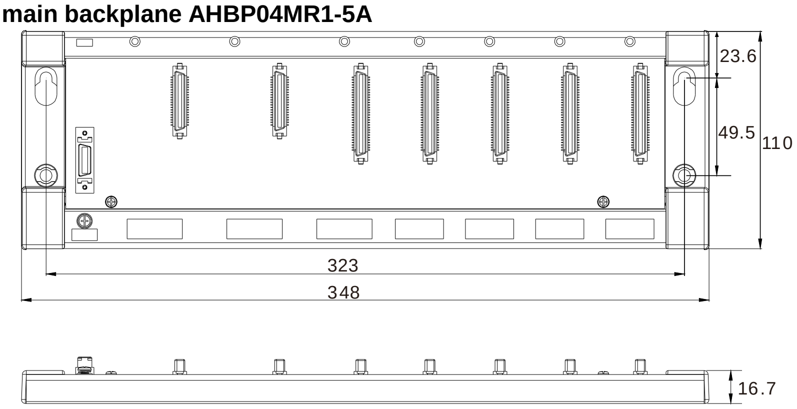
Unit: mm

- **Extension backplane AHBP08E1-5A**



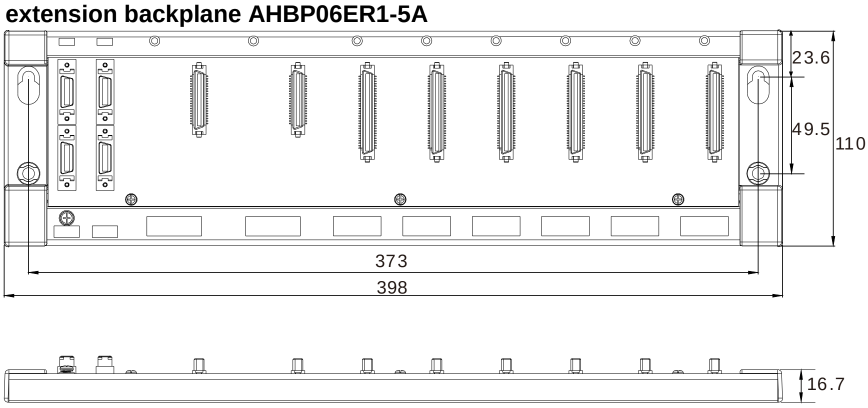
Unit: mm

- **Redundant main backplane AHBP04MR1-5A**



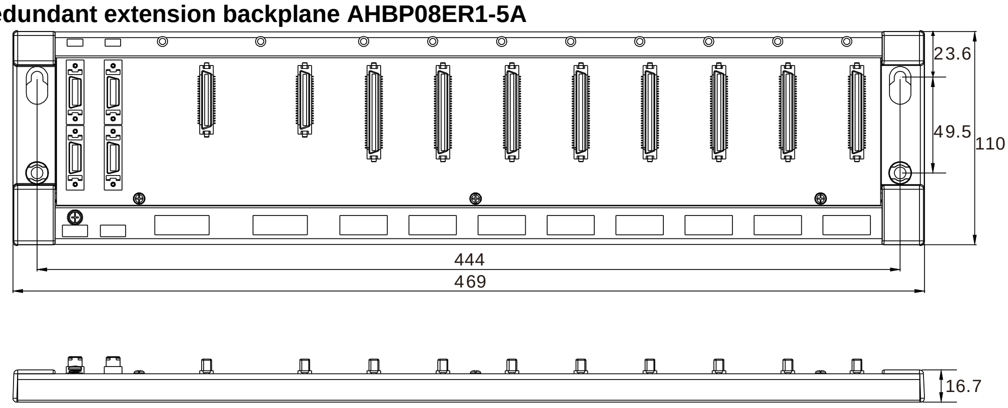
Unit: mm

- **Redundant extension backplane AHBP06ER1-5A**



Unit: mm

- **Redundant extension backplane AHBP08ER1-5A**



Unit: mm

2.5 Specifications for the Power Supply Module

2.5.1 General Specifications

- **AHPS05-5A**

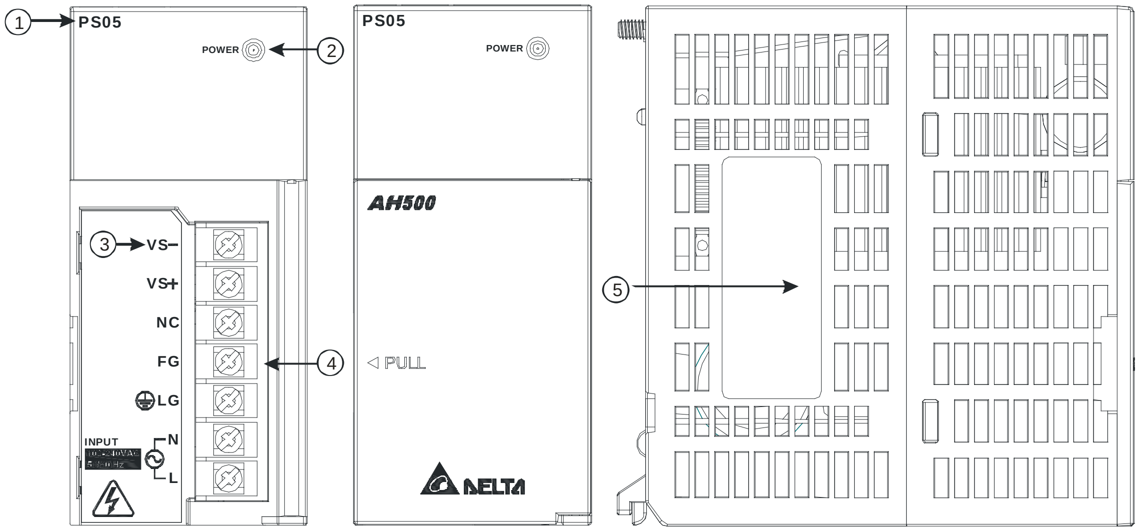
Item	Specifications
Supply voltage	100~240 VAC (-15%~10%) 50/60 Hz±5%
Maximum input power	100 VAC/1.2A~240 VAC/0.68A; 70 W
Action specifications	If the input power supply is larger than 85 VAC, the power supply module can function normally.
Allowable instantaneous power failure time	If the instantaneous power failure time is within ten milliseconds, the power supply module keeps running.
Fuse	4 A/250 VAC
Inrush current	45 A within 1 millisecond at 115 VAC
24 VDC output	The maximum current is 2.5 A. It is only for a backplane.
Power protection	The 24 VDC output is equipped with the short circuit protection and the overcurrent protection.
Maximum output power	60 W
Surge voltage withstand level	1,500 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
Insulation voltage	Above 5 MΩ (The voltage between all inputs/outputs and the ground is 500 VDC.)
Ground	The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.
Weight	380g

- **AHPS15-5A**

Item	Specifications
Supply voltage	24 VDC (-35%, +30%)
Maximum input power	24 VDC / 2A; 48 W
Allowable instantaneous power failure time	10 milliseconds
Fuse	6.3 A/250 VAC
Inrush current	30 A within 100 milliseconds
24 VDC output	1.5 A
Maximum output power	36 W
Power protection	The 24 VDC output is equipped with the short circuit protection, the overcurrent protection, and the overvoltage protection.
Surge voltage withstand level	500 VAC
Ground	The diameter of the ground should be greater than 1.6 mm^2.
Weight	380g

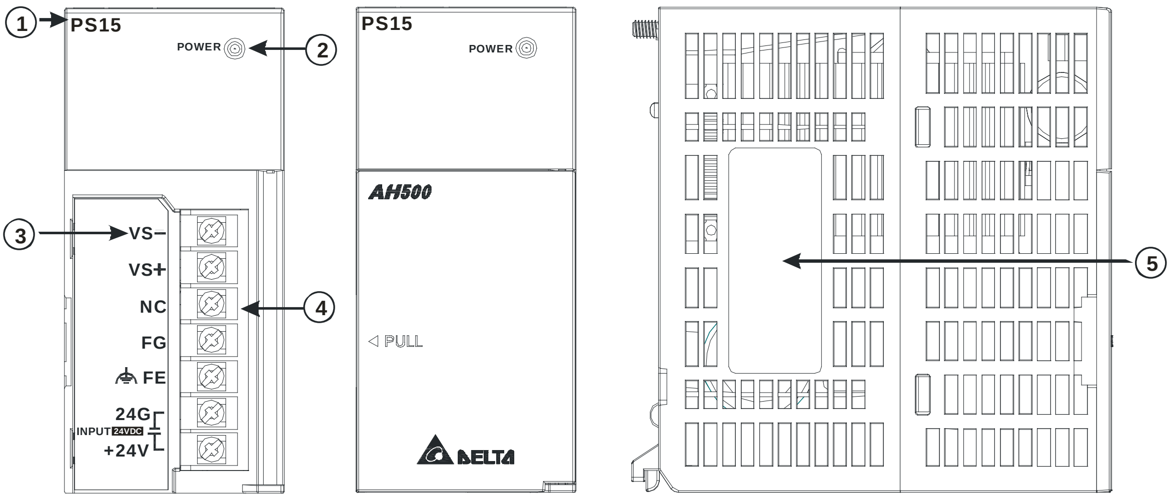
2.5.2 Profile

- **AHPS05-5A**



Number	Name	Description
1	Model name	Model name of the power supply module
2	POWER LED indicator (green)	Indicating the status of the power supply
3	Arrangement of the terminals	VS-: It is connected to the negative 24 VDC power supply. VS+: It is connected to the positive 24 VDC power supply. NC: No connection FG: Functional ground LG: Line ground L/N: AC power input
4	Terminal	Terminal for wiring
5	Label	Nameplate

- **AHPS15-5A**

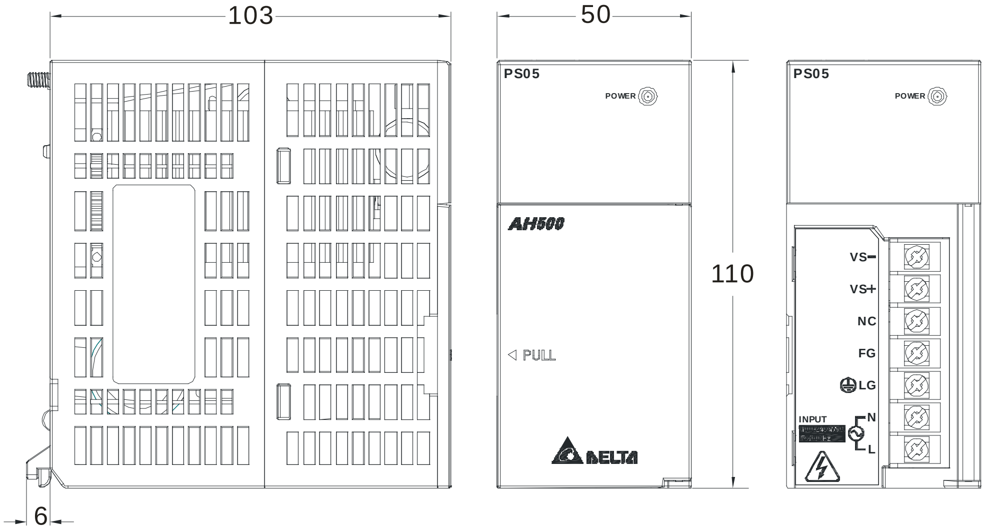


Number	Name	Description
1	Model name	Model name of the power supply module
2	POWER LED indicator (green)	Indicating the status of the power supply
3	Arrangement of the terminals	VS-: It is connected to the negative 24 VDC power supply. VS+: It is connected to the positive 24 VDC power supply.

Number	Name	Description
		NC: No connection FG: Functional ground FE: Line ground 24G/+24V: DC power input
4	Terminal	Terminal for wiring
5	Label	Nameplate

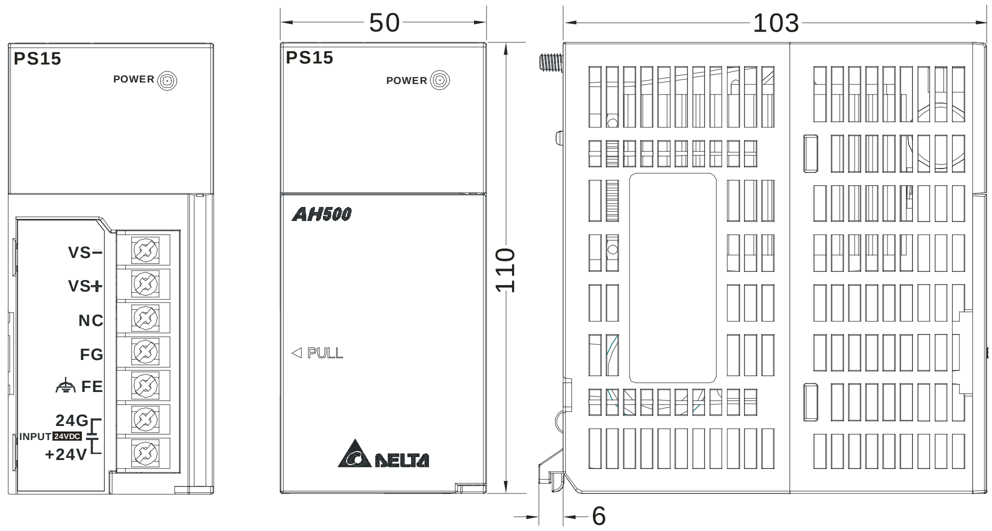
2.5.3 Dimensions

- **AHPS05-5A**



Unit: mm

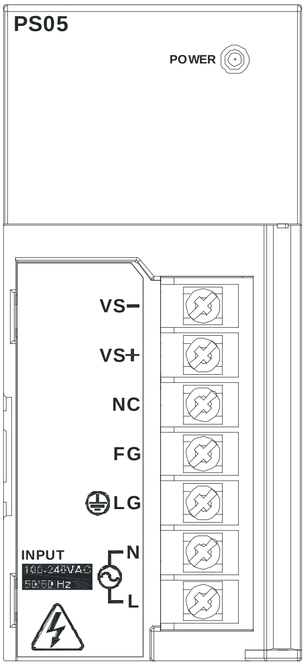
- **AHPS15-5A**



Unit: mm

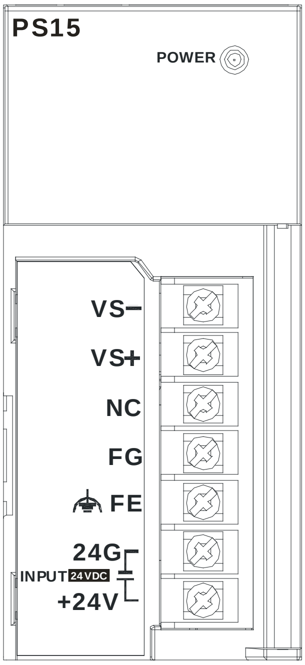
2.5.4 Arrangement of Terminals

- **AHPS05-5A**



- VS-: It is connected to the negative 24 VDC power supply, and used to detect the external power supply.
- VS+: It is connected to the positive 24 VDC power supply, and used to detect the external power supply.
- NC: No connection
- FG: Functional ground
- LG: Line ground
- L/N: AC power input

- **AHPS15-5A**



- VS-: It is connected to the negative 24 VDC power supply, and used to detect the external power supply.
- VS+: It is connected to the positive 24 VDC power supply, and used to detect the external power supply.
- NC: No connection
- FG: Functional ground
- FE: Line ground
- 24G/+24V: DC power input

2.6 Specifications for Digital Input/Output Modules

2.6.1 General Specifications

- **Electrical specifications for the inputs on digital input/output modules (The signals passing through the inputs are 24 VDC signals.)**

Item \ Model		AH16AM10N-5A	AH32AM10N-5A	AH32AM10N-5B	AH32AM10N-5C	AH64AM10N-5C	AH16AP11R-5A	AH16AP11T-5A	AH16AP11P-5A
Number of inputs		16	32	32	32	64	8	8	8
Connector type		Removable terminal block		DB37 connector	Latch connector		Removable terminal block		
Input type		Digital input							
Input form		Direct current (sinking or sourcing)							
Input current		24 VDC 5 mA				24 VDC 3.2 mA	24 VDC 5 mA		
Action level	**OFF→ON**	>15 VDC							
	ON→OFF	<5 VDC							
Response time	**OFF→ON**	10 ms±10%							
	ON→OFF	15 ms±10%							
Maximum input frequency		50 Hz							
Input impedance		4.7 kΩ				7.5 kΩ	4.7 kΩ		
Input signal		Voltage input Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors.							
Electrical isolation/Voltage		Optocoupler; 500VAC							
Input display		When the optocoupler is driven, the input LED indicator is ON.							
Weight		190g	180g	150g	140g	220g	225g	190g	190g

- **Electrical specifications for the inputs on a digital input/output module (The signals passing through the inputs are alternating current signals ranging in voltage from 120 V to 240 V.)**

Item \ Model		AH16AM30N-5A
Number of inputs		16
Connector type		Removable terminal block
Input type		Digital input
Input form		Alternating current
Input current		120 VAC and 4.5 mA; 240 VAC and 9 mA
Action level	**OFF→ON**	>79 VAC
	ON→OFF	<40 VAC
Response time	**OFF→ON**	15 ms
	ON→OFF	30 ms
Electrical isolation/Voltage		Optocoupler; 1500VAC
Input display		When the optocoupler is driven, the input LED indicator is ON.
Weight		220g

- **Electrical specifications for the inputs on a digital input/output module which supports I/O interrupts (The signals passing through the inputs are 24 VDC signals.)**

Item \ Model		16AR10N-5A				
Number of inputs		16				
Input power form		Direct current				
Connector type		Removable terminal block				
Input type		Digital input				
Input form		Direct current (sinking or sourcing)				
Input current		24 VDC, 5 mA				
Action level	**OFF→ON**	>15 VDC				
	ON→OFF	<5 VDC				
Response time	**Filtering cycle**	0.1 ms	0.5 ms	3 ms	15 ms	20 ms
	OFF→ON (Typical)	0.11 ms	0.51 ms	3.01 ms	15.01 ms	20.01 ms
	OFF→ON (Maximum)	0.12 ms	0.52 ms	3.02 ms	15.02 ms	20.02 ms
	ON→OFF (Typical)	0.11 ms	0.51 ms	3.01 ms	15.01 ms	20.01 ms
	ON→OFF (Maximum)	0.15 ms	0.55 ms	3.05 ms	15.05 ms	20.05 ms
Input impedance		ON→OFF				
Input signal		Voltage input Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors.				
Electrical isolation/Voltage		Optocoupler; 500VAC				
Input display		When the optocoupler is driven, the input LED indicator is ON.				
Trigger for an interrupt		An interrupt is triggered when there is a transision in a signal from low to high/from high to low/from low to high or from high to low.				
Interrupt service routine		The interrupt service routine numbers which can be set are in the rangeof 0 to 31.				
Filtering cycle which can be set for an input channel		0.1 ms, 0.5 ms, 3 ms (default), 15 ms, or 20 ms				
Weight		190g				

- **Electrical specifications for the outputs on digital input/output modules**

Item \ Model		AH16AN01R-5A	AH16AP11R-5A	AH16AN01T-5A	AH16AP11T-5A	AH16AN01P-5A	AH16AP11P-5A	AH16AN01S-5A
Number of outputs		16	8	16	8	16	8	16
Connector type		Removable terminal block						
Output type		Realy-R		Transistor-T (sinking)		Transistor-P (sourcing)		TRIAC-S
Voltage specifications		250 VAC, and below 30 VDC		12~30 VDC[*2]		12~30 VDC[*2]		120/240 VAC
Electrical isolation/Voltage		Opto-coupler; 500VAC	Relay; 500VAC	Opto-coupler; 500VAC		Opto-coupler; 500VAC		Opto-coupler; 1500VAC
Maximum load	**Resistance**	2 A/output (5 A/COM)		0.5 A/output (4 A/COM)		0.5 A/output (4 A/COM)		0.5 A/output (2 A/COM)
	Inductance	Life cycle curve[*3]		12 W (24 VDC)		12 W (24 VDC)		Not applicable

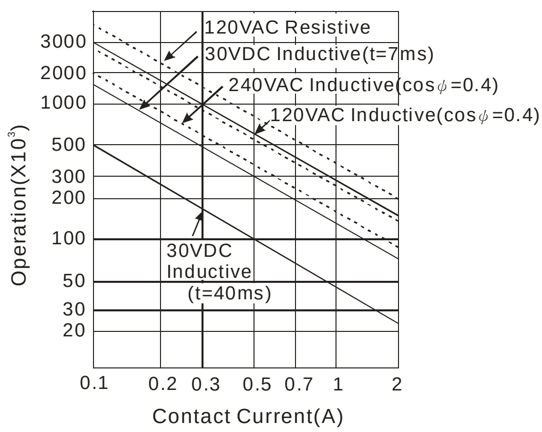
Item \ Model		AH16AN01R-5A	AH16AP11R-5A	AH16AN01T-5A	AH16AP11T-5A	AH16AN01P-5A	AH16AP11P-5A	AH16AN01S-5A
	Bulb	20 W (24 VDC) 100 W (230 VAC)		2 W (24 VDC)		2 W (24 VDC)		60 W AC
Maximum output frequency*1	Resistance	1 Hz		100 Hz		100 Hz		10 Hz
	Inductance	0.5 Hz		0.5 Hz		0.5 Hz		-
	Bulb	1 Hz		10 Hz		10 Hz		10 Hz
Maximum Response time	OFF→ON	10 ms		0.5 ms		0.5 ms		1 ms+0.5 AC cycles
	ON→OFF							
Weight		225g	225g	190g	190g	190g	190g	190g

Item \ Model		AH32AN02T-5A	AH32AN02P-5A	AH32AN02T-5B	AH32AN02P-5B	AH32AN02T-5C	32AN02P-5C	AH64AN02T-5C	AH64AN02P-5C
Number of outputs		32	32	32	32	32	32	64	64
Connector type		Removable terminal block		DB37 connector		Latch connector			
Output type		Transistor–T (sinking) Transistor-P (sourcing)							
Voltage specifications		12~30 VDC*2							
Electrical isolation/Voltage		Opto-coupler; 500VAC							
Maximum load	Resistance	0.1 A/output (1 A/COM)							
	Inductance	Not applicable							
	Bulb	Not applicable							
Maximum output frequency*1	Resistance	100 Hz							
	Inductance	-							
	Bulb	-							
Maximum Response time	OFF→ON	0.5 ms							
	ON→OFF								
Weight		180g	180g	150g	150g	140g	140g	220g	220g

*1: The scan cycle affects the frequency.

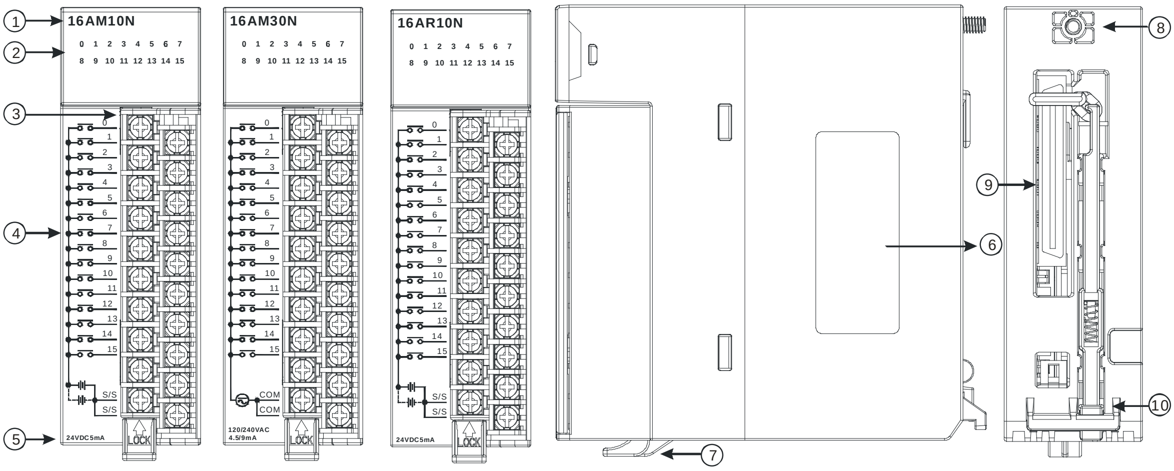
*2: The terminals UP and ZP needs to be connected to the 24 VDC auxiliary power supply (-15%~+20%), and the rated current consumption is 1 mA/output.

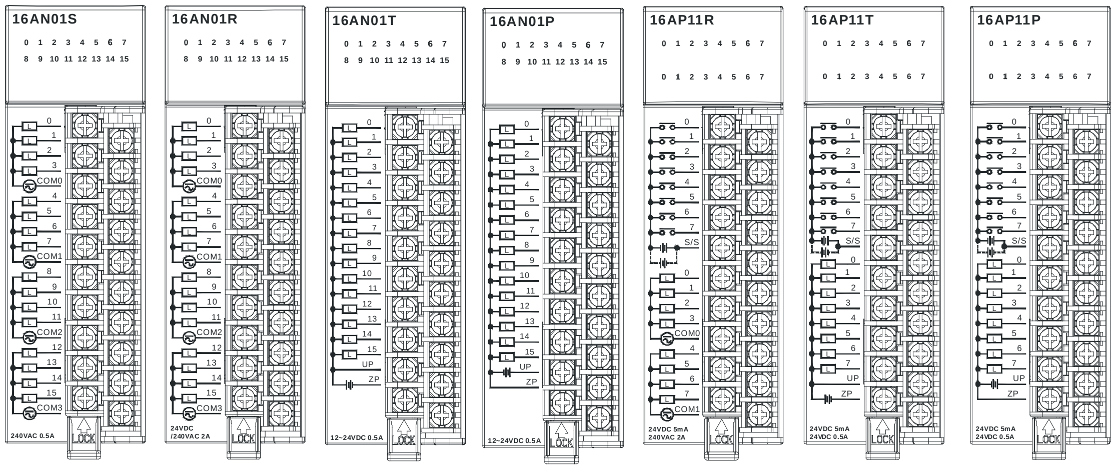
*3: Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosψ, the time constant t(L/R)), and the current passing through the terminal. The relation is shown in the life cycle curve below.



2.6.2 Profiles

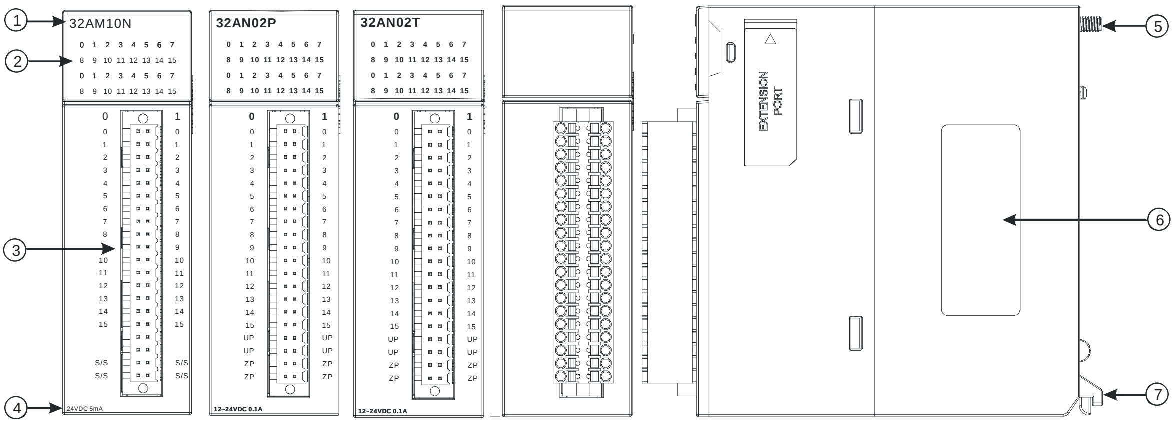
- **AH16AM10N-5A/AH16AM30N-5A/AH16AR10N-5A/AH16AN01S-5A/AH16AN01R-5A/AH16AN01T-5A/AH16AN01P-5A/AH16AP11R-5A/AH16AP11T-5A/AH16AP11P-5A**





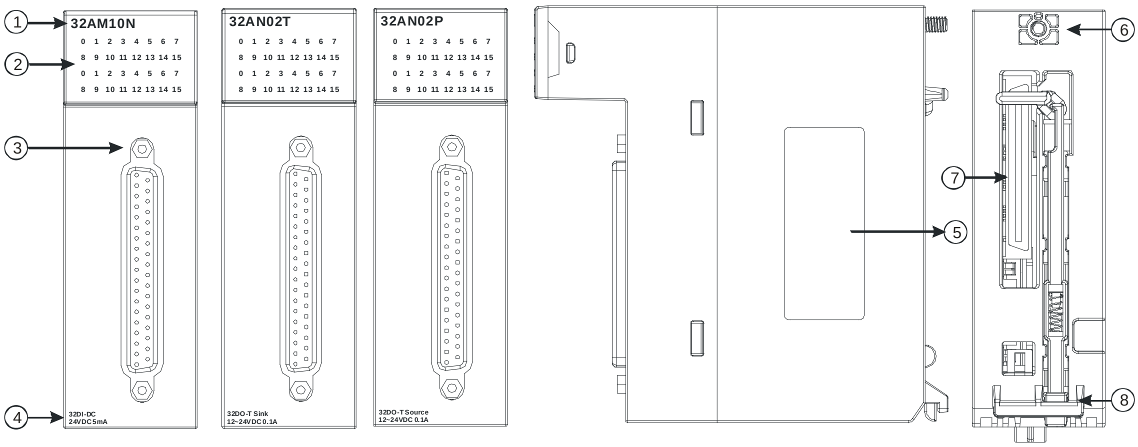
Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	Removable terminal block	The inputs are connected to a switch or a sensor. The outputs are connected to a load which will be driven, e.g. a contact, or a solenoid valve.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Description of the inputs/outputs	Number of inputs/outputs and specifications
6	Label	Nameplate
7	Clip	Fixing the removable terminal block
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

- **AH32AM10N-5A/AH32AN02T-5A/AH32AN02P-5A**



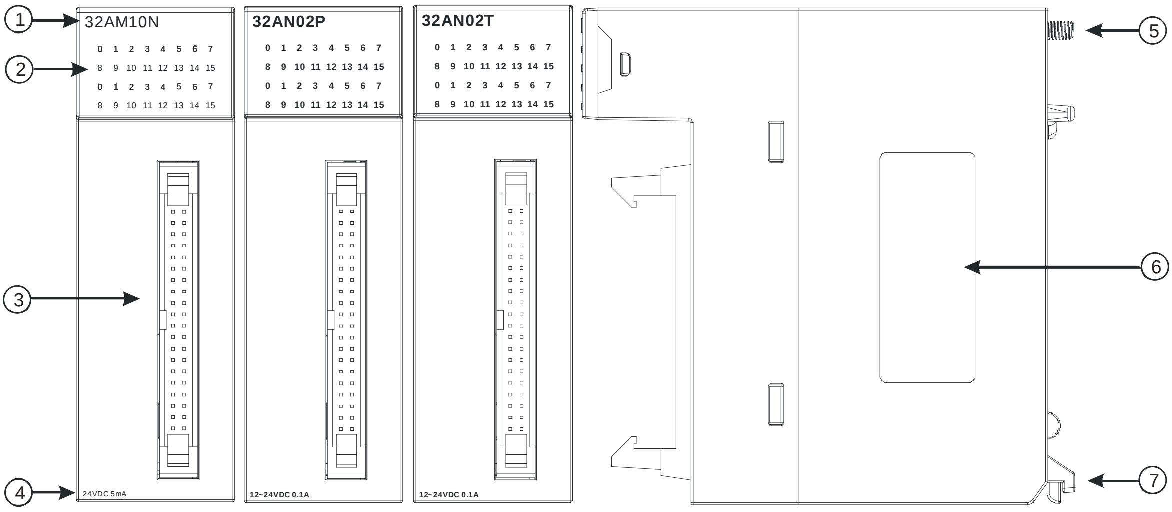
Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	Removable terminal block	The inputs are connected to a switch or a sensor. The outputs are connected to a load which will be driven, e.g. a contact, or a solenoid valve.
4	Description of the inputs/outputs	Number of inputs/outputs and specifications
5	Set screw	Fixing the module
6	Label	Nameplate
7	Projection	Fixing the module

- **AH32AM10N-5B/AH32AN02T-5B/AH32AN02P-5B**



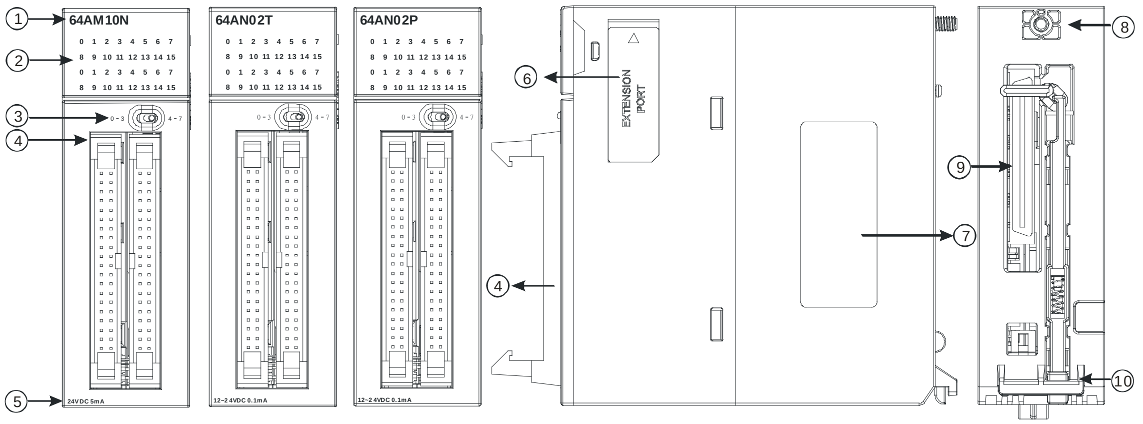
Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	DB37 connector	It is connected to the I/O extension cable UC-ET010-33B.
4	Description of the inputs/outputs	Number of inputs/outputs and specifications
5	Label	Nameplate
6	Set screw	Fixing the module
7	Connector	Connecting the module and a backplane
8	Projection	Fixing the module

- **AH32AM10N-5C/AH32AN02T-5C/AH32AN02P-5C**



Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	Latch connector	It is connected to the I/O extension cable UC-ET010-24A / UC-ET010-24C
4	Description of the inputs/outputs	Number of inputs/outputs and specifications
5	Set screw	Fixing the module
6	Label	Nameplate
7	Projection	Fixing the module

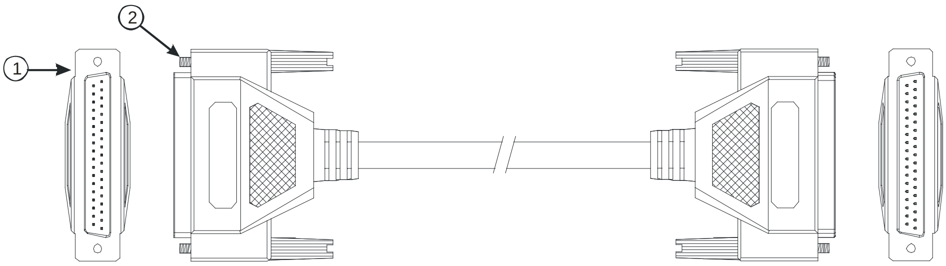
- **AH64AM10N-5C/AH64AN02T-5C/AH64AN02P-5C**



Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	LED indicator switch	Left: High 32 bits Right: Low 32 bits
4	Latch connector	It is connected to the I/O extension cable UC-ET010-24A / UC-ET010-24C
5	Description of the inputs/outputs	Number of inputs/outputs and specifications
6	Extension port	Updating the firmware
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	It connects the module and a backplane.
10	Projection	Fixing the module

- **DB37 connector, I/O extension cable, and external terminal module**

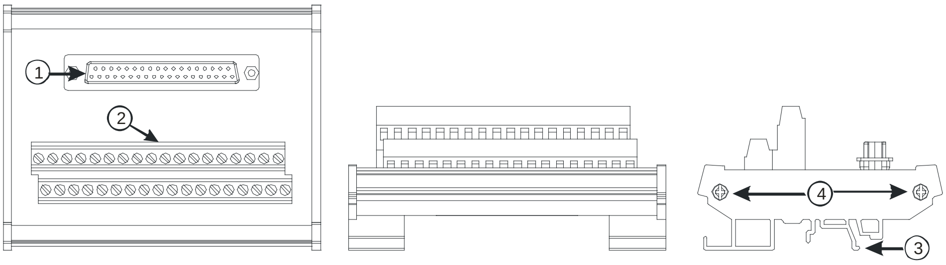
1. I/O extension cable UC-ET010-33B



Number	Name	Description
1	DB37 connector	Connecting a digital input/output module and an external terminal module.
2	Set screw	Fixing the connector

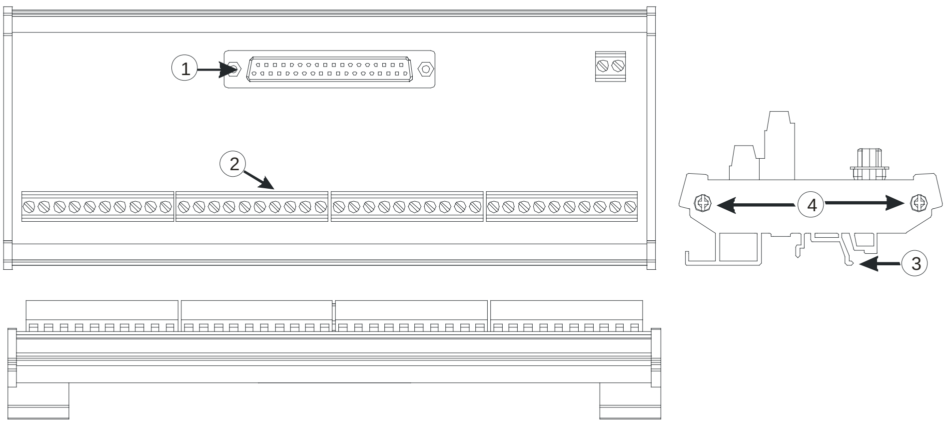
2. External terminal module for AH32AM10N-5B:

◆ UB-10-ID32B

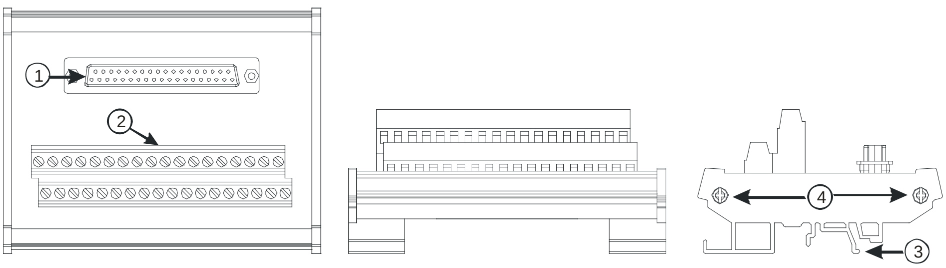


3. External terminal modules for AH32AN02T-5B

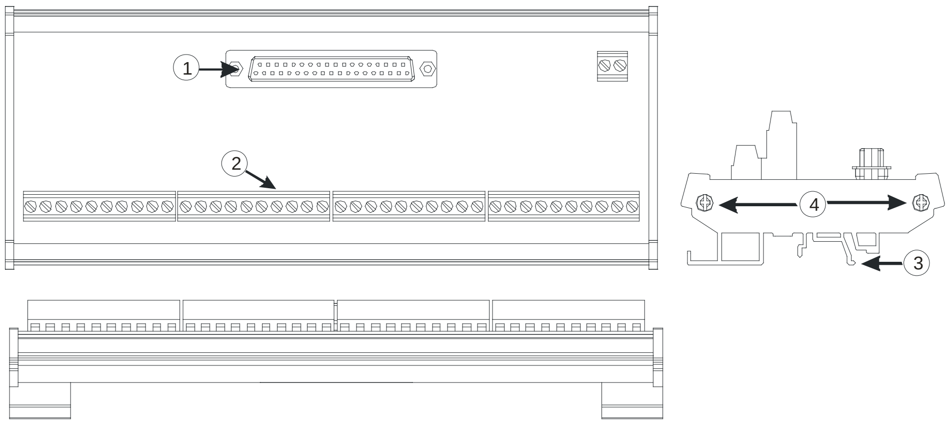
◆ UB-10-OR32A



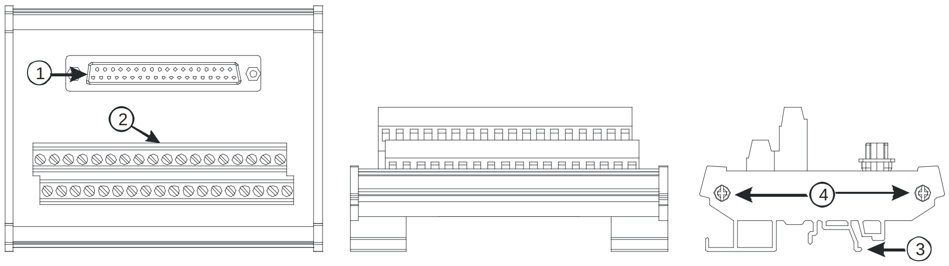
◆ UB-10-OT32B



4. External terminal modules for AH32AN02P-5B
   - UB-10-OR32B



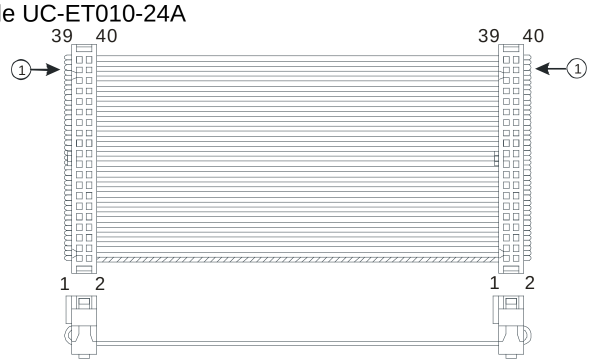
   - UB-10-OT32B



Number	Name	Description
1	DB37 connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

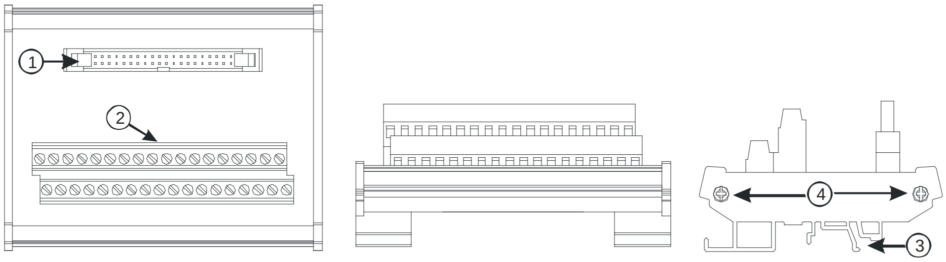
- **Latch connector, I/O extension cable, and external terminal module**

1. I/O extension cable UC-ET010-24A



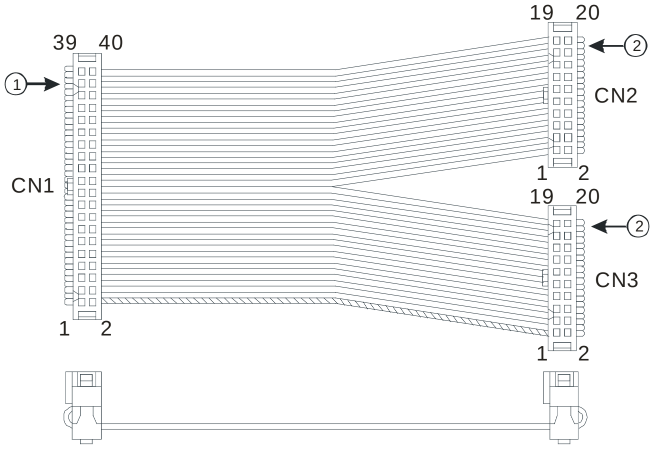
Number	Name	Description
1	40-pin IDC connector	Connecting a digital input/output module and the external terminal module UB-10-ID32A.

2. External terminal module for AH32AM10N-5C/AH64AM10N-5C: UB-10-ID32A



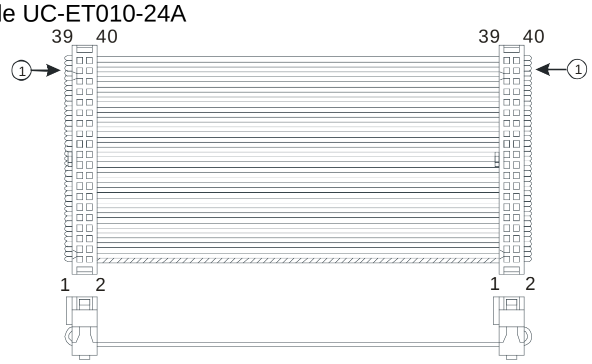
Number	Name	Description
1	40-pin latch connector	Connecting the external terminal module and a digital input/output module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

3. I/O extension cable UC-ET010-24C



Number	Name	Description
1	40-pin IDC connector	Connecting a digital input/output module and an external terminal module
2	20-pin IDC connector	Connecting a digital input/output module and the external terminal module UB-10-OR16A or UB-10-OR16B

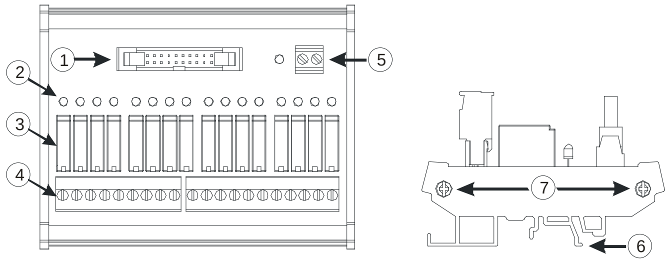
4. I/O extension cable UC-ET010-24A



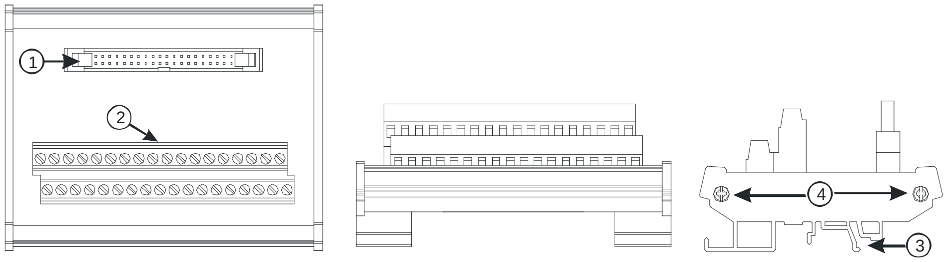
Number	Name	Description
1	40-pin IDC connector	Connecting a digital input/output module and the external terminal module UB-10-OT32A

5. External terminal modules for AH32AN02T-5C/AH64AN02T-5C

◆ UB-10-OR16A

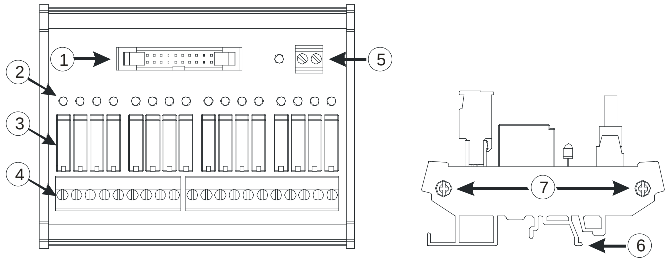


◆ UB-10-OT32A

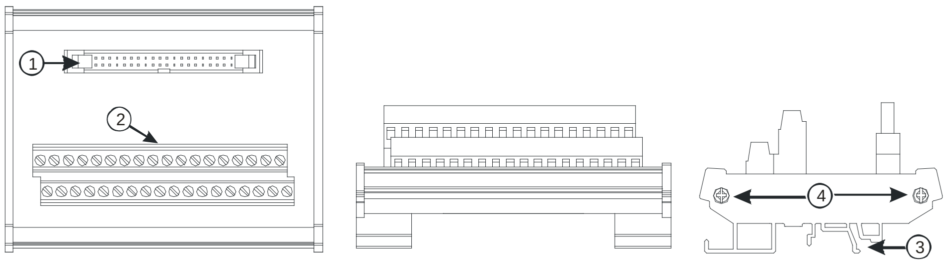


6. External terminal module for AH32AN02P-5C/AH64AN02P-5C

◆ UB-10-OR16B



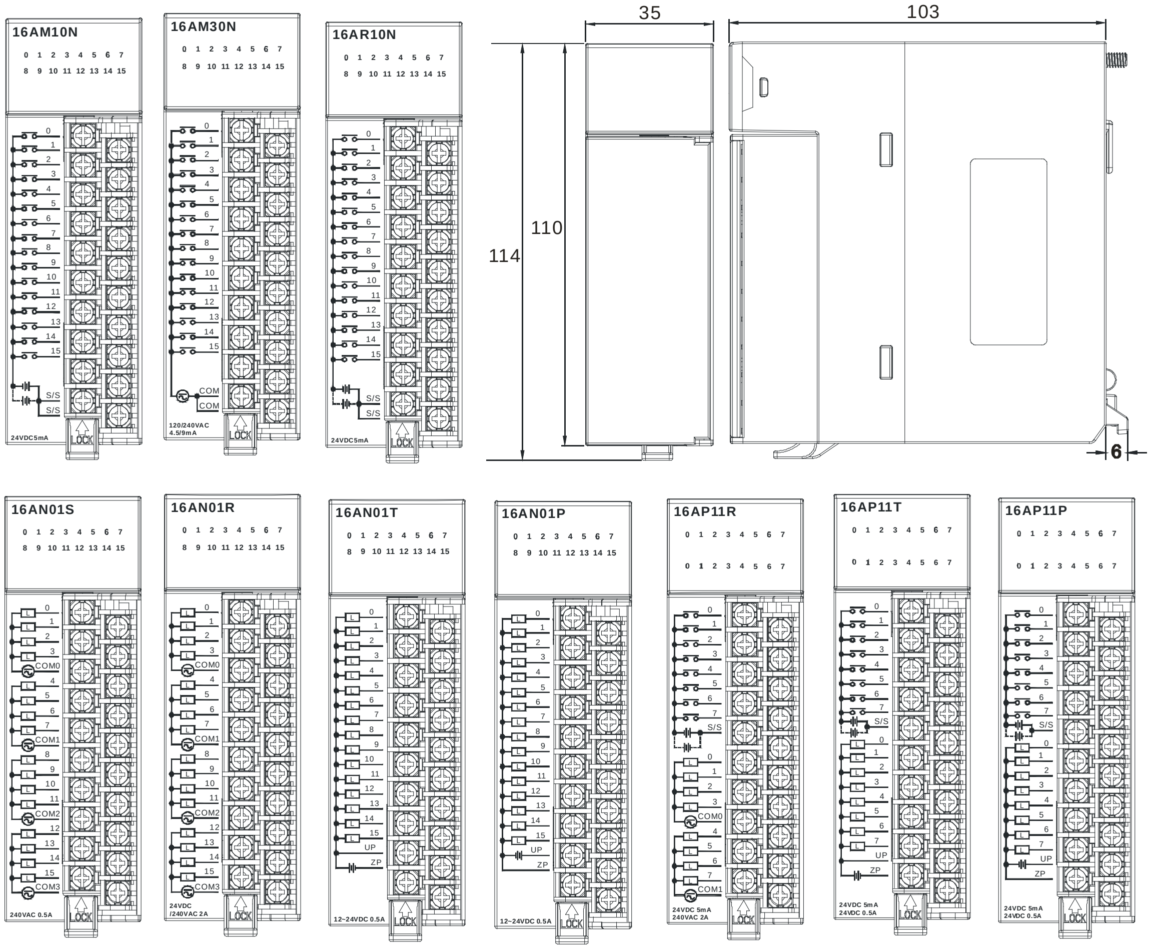
◆ UB-10-OT32A



Number	Name	Description
1	20-pin latch connector	Connecting the external terminal module and a digital input/output module
2	Output LED indicator	If there is an output signal, the output LED indicator is ON.
3	Output relay	Output relay
4	Output terminal	Output terminal for wiring
5	Power input terminal	Power input terminal for wiring
6	Clip	Hanging the external terminal module on a DIN rail
7	Set screw	Fixing the base

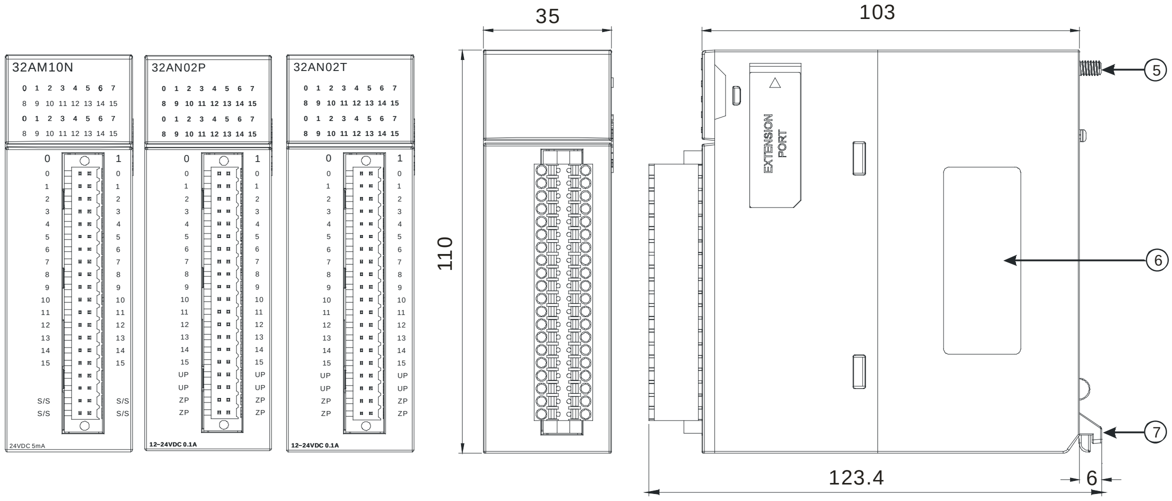
2.6.3 Dimensions

- **AH16AM10N-5A/AH16AM30N-5A/AH16AR10N-5A/AH16AN01S-5A/AH16AN01R-5A/AH16AN01T-5A/AH16AN01P-5A/AH16AP11R-5A/AH16AP11T-5A/AH16AP11P-5A**



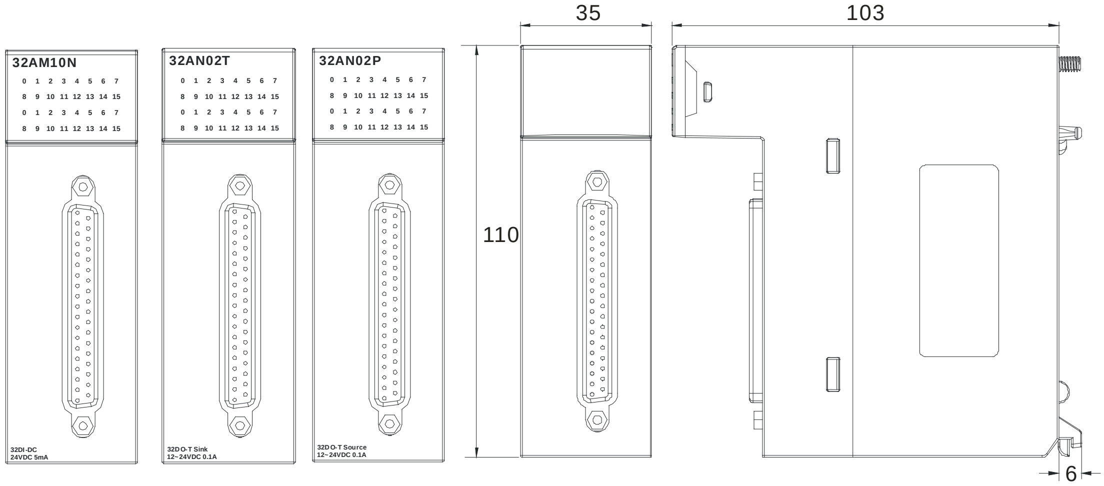
Unit: mm

- **AH32AM10N-5A/AH32AN02T-5A/AH32AN02P-5A**



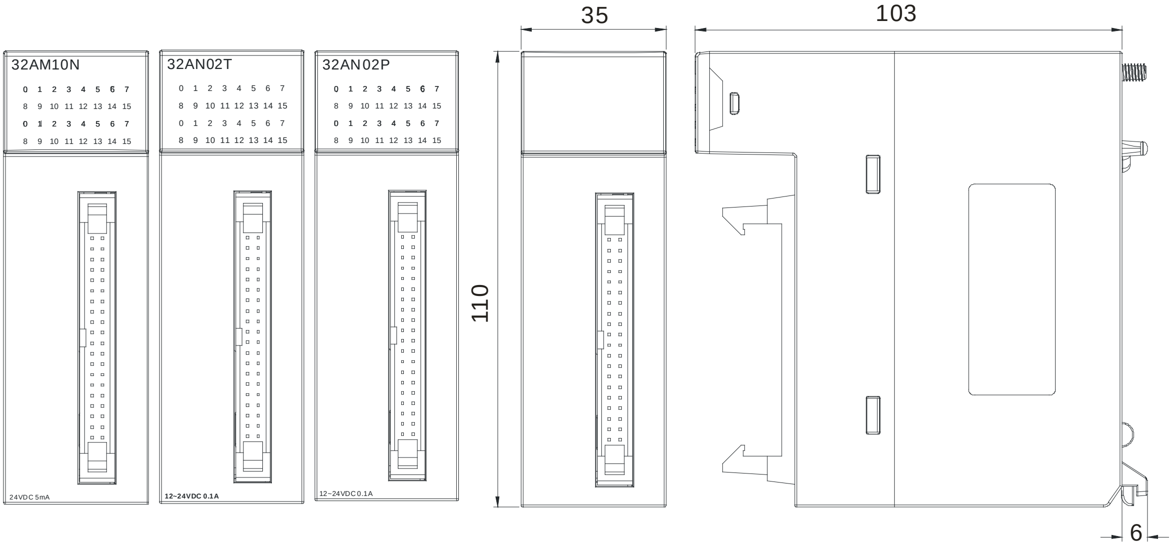
Unit: mm

- **AH32AM10N-5B/AH32AN02T-5B/AH32AN02P-5B**



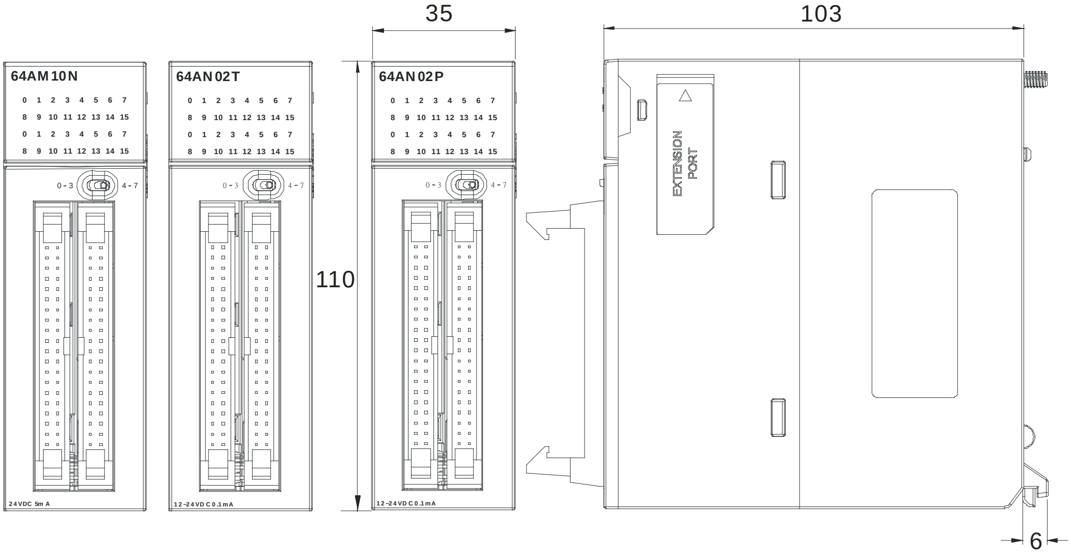
Unit: mm

- **AH32AM10N-5C/AH32AN02T-5C/AH32AN02P-5C**



Unit: mm

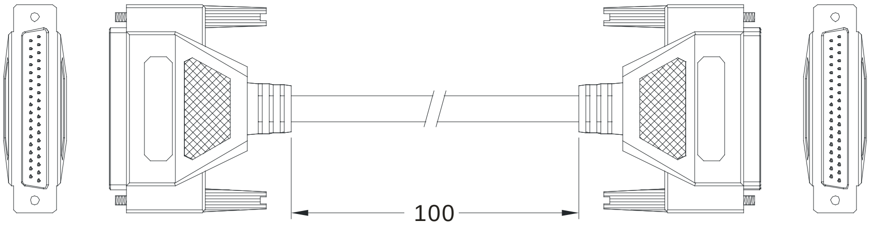
- **AH64AM10N-5C/AH64AN02T-5C/AH64AN02P-5C**



Unit: mm

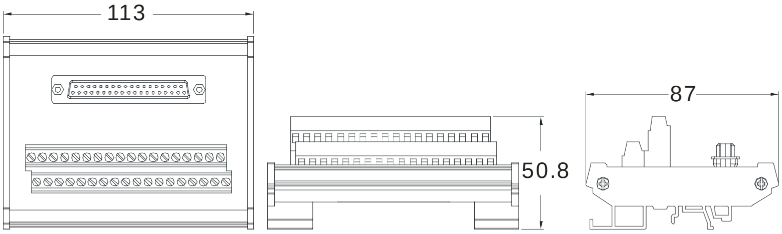
- **DB37 connector, I/O extension cable, and external terminal module**

1. I/O extension cable UC-ET010-33B



Unit: cm

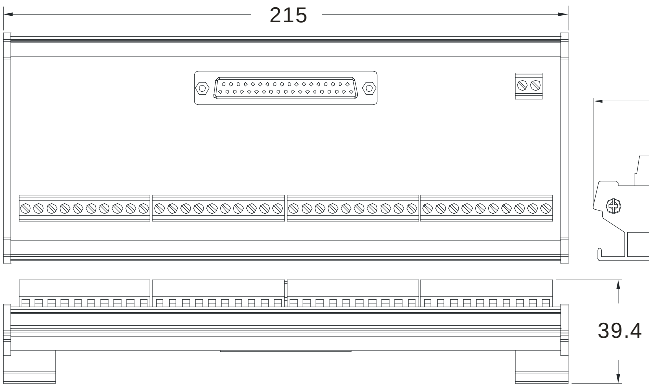
2. External terminal module for AH32AM10N-5B: UB-10-ID32B



Unit: mm

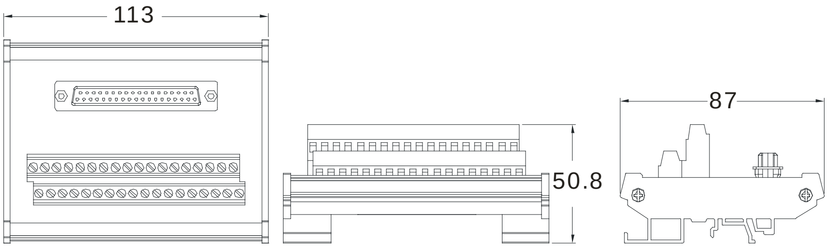
3. External terminal modules for AH32AN02T-5B

◆ UB-10-OR32A



Unit: mm

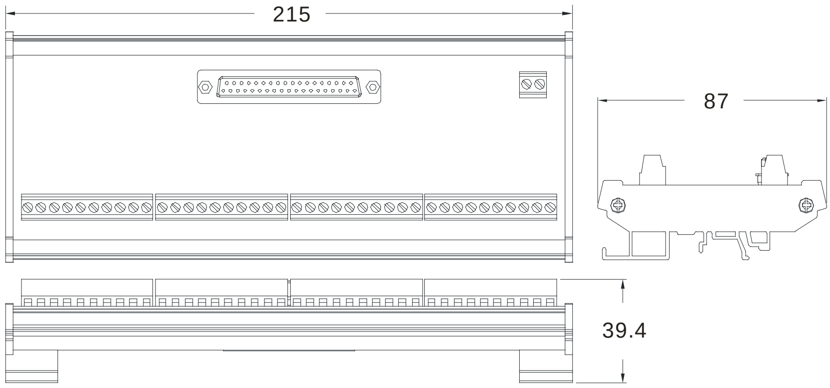
◆ UB-10-OT32B



Unit: mm

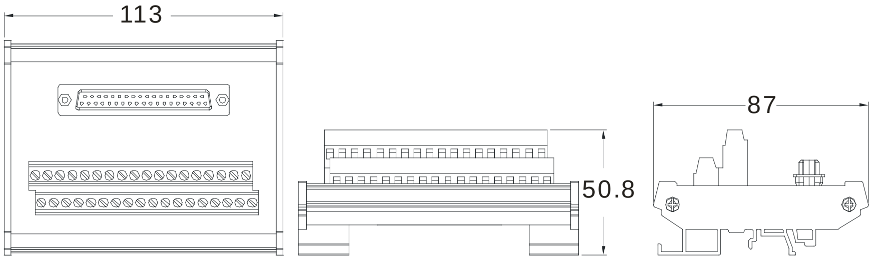
4. External terminal modules for AH32AN02P-5B

◆ UB-10-OR32B



Unit: mm

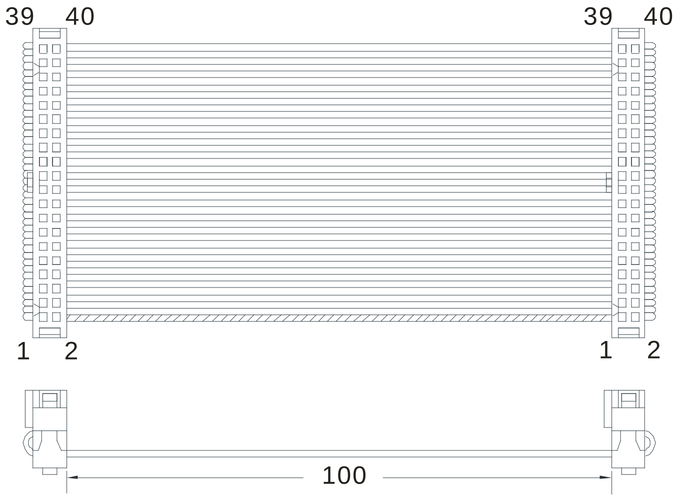
◆ UB-10-OT32B



Unit: mm

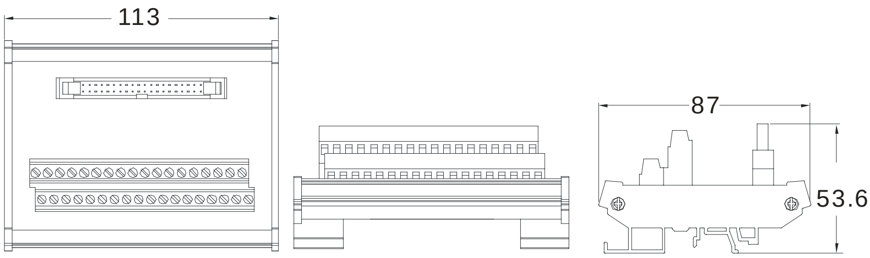
- **Latch connector, I/O extension cable, and external terminal module**

1. I/O extension cable UC-ET010-24A



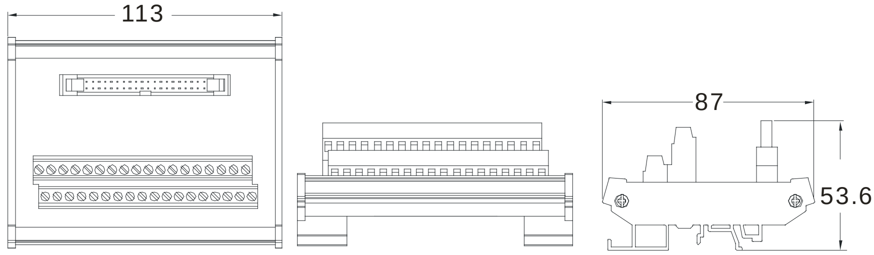
Unit: cm

2. External terminal module for AH32AM10N-5C/AH64AM10N-5C: UB-10-ID32A



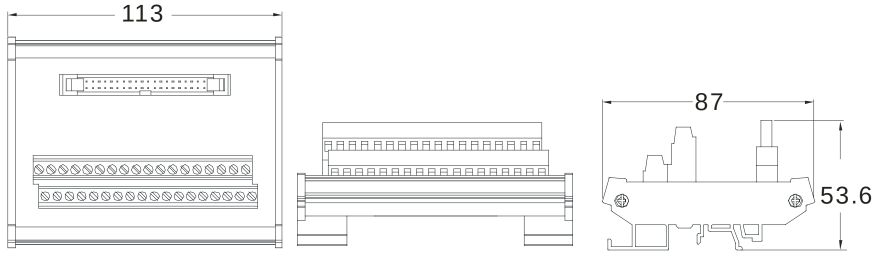
Unit: mm

3. External terminal module for AH32AN02T-5C/AH64AN02T-5C: UB-10-OT32A



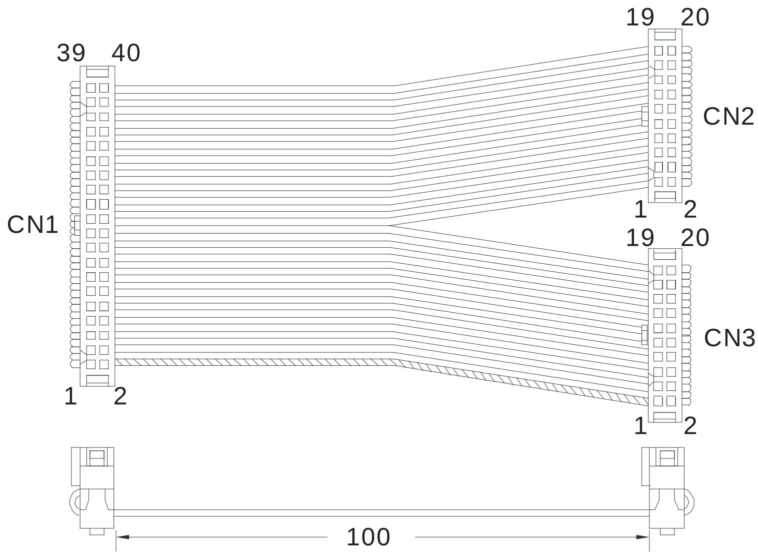
Unit: mm

4. External terminal module for AH32AN02P-5C/AH64AN02P-5C: UB-10-OT32A



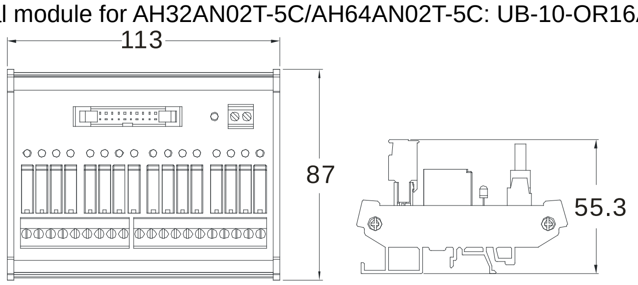
Unit: mm

5. I/O extension cable UC-ET010-24C



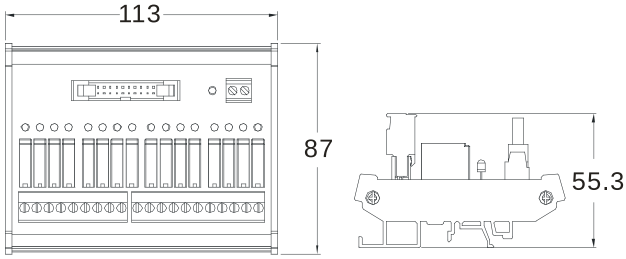
Unit: cm

6. External terminal module for AH32AN02T-5C/AH64AN02T-5C: UB-10-OR16A



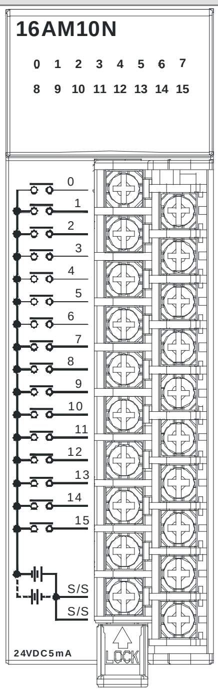
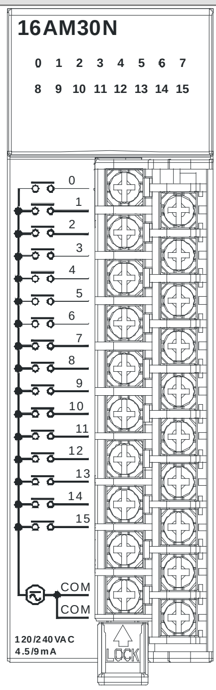
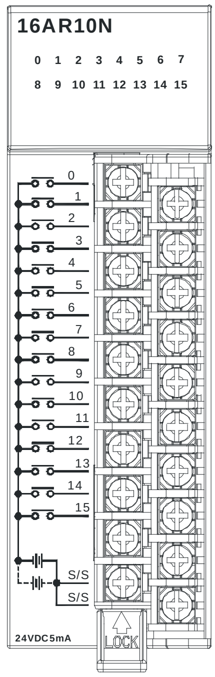
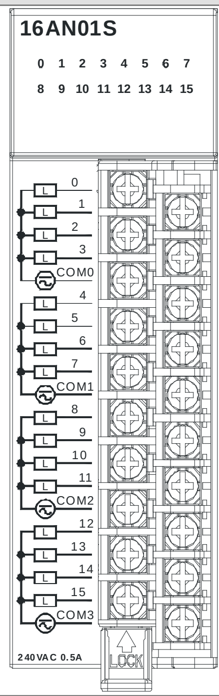
Unit: mm

7. External terminal module for AH32AN02P-5C/AH64AN02P-5C: UB-10-OR16B



Unit: mm

2.6.4 Arrangement of Input/Output Terminals

<table>
<tr><th>AH16AM10N-5A</th><th>AH16AM30N-5A</th><th>AH16AR10N-5A</th><th>AH16AN01S-5A</th></tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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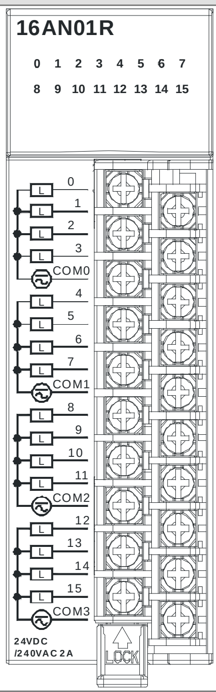
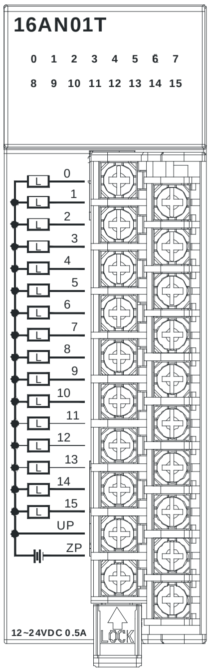
2

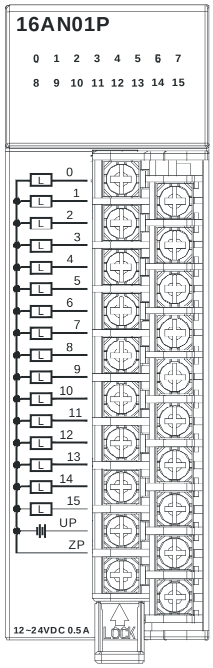
AH16AN01R-5A



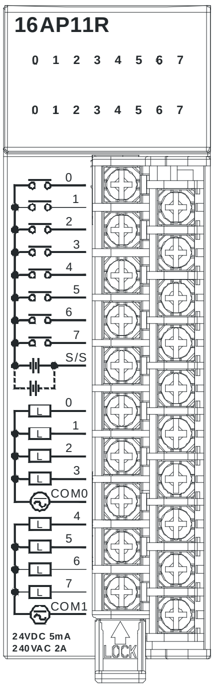
AH16AN01T-5A



AH16AN01P-5A



AH16AP11R-5A



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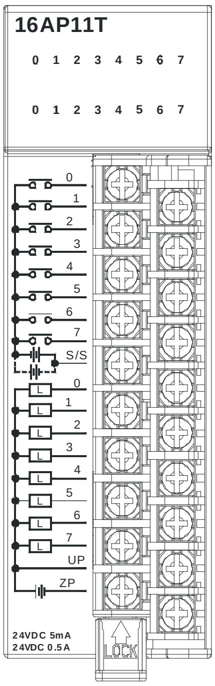

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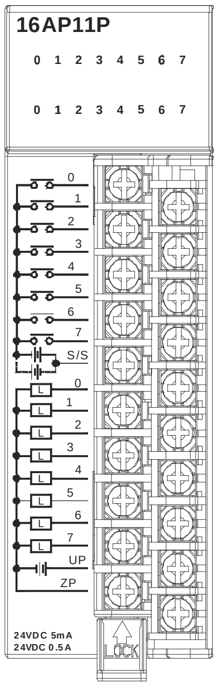
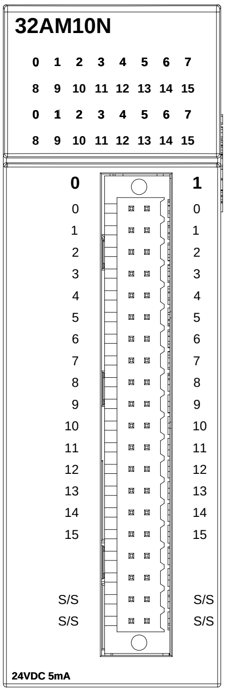
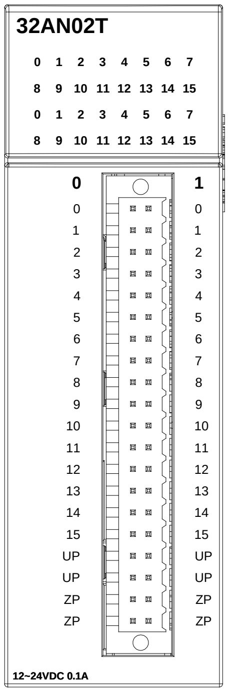


AH32AM10N-5A



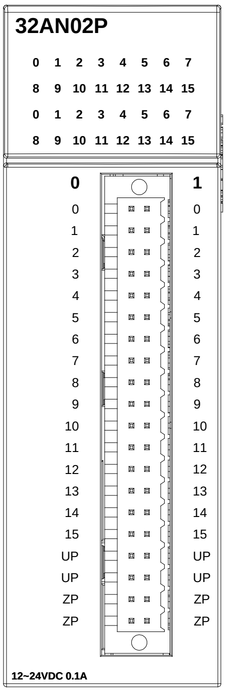
0.0	1.0
0.1	1.1
0.2	1.2
0.3	1.3
0.4	1.4
0.5	1.5
0.6	1.6
0.7	1.7
0.8	1.8
0.9	1.9
0.10	1.10
0.11	1.11
0.12	1.12
0.13	1.13
0.14	1.14
0.15	1.15
-	-
-	-
S/S	S/S
S/S	S/S

AH32AN02T-5A



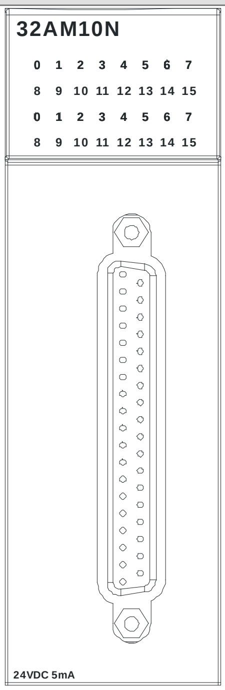
0.0	1.0
0.1	1.1
0.2	1.2
0.3	1.3
0.4	1.4
0.5	1.5
0.6	1.6
0.7	1.7
0.8	1.8
0.9	1.9
0.10	1.10
0.11	1.11
0.12	1.12
0.13	1.13
0.14	1.14
0.15	1.15
UP	UP
UP	UP
ZP	ZP
ZP	ZP

AH32AN02P-5A



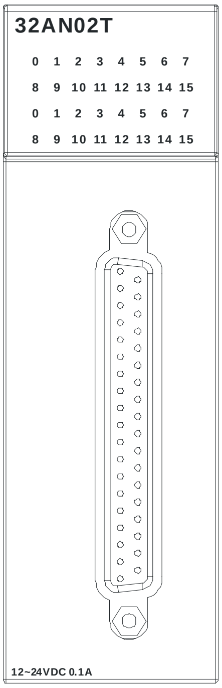
0.0	1.0
0.1	1.1
0.2	1.2
0.3	1.3
0.4	1.4
0.5	1.5
0.6	1.6
0.7	1.7
0.8	1.8
0.9	1.9
0.10	1.10
0.11	1.11
0.12	1.12
0.13	1.13
0.14	1.14
0.15	1.15
UP	UP
UP	UP
ZP	ZP
ZP	ZP

AH32AM10N-5B



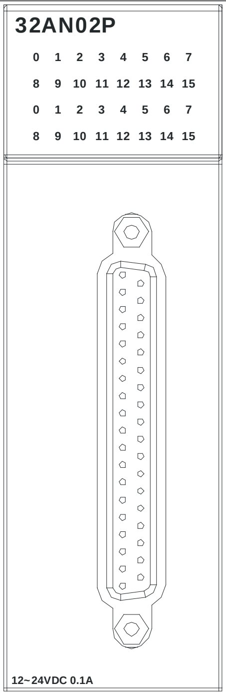
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
S/S	S/S
NC	1.0
1.1	1.2
1.3	1.4
1.5	1.6
1.7	1.8
1.9	1.10
1.11	1.12
1.13	1.14
1.15	S/S
S/S	

AH32AN02T-5B



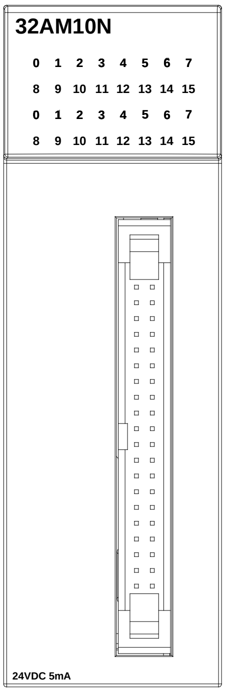
AH32AN02T-5B	
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
ZP	ZP
UP	1.0
1.1	1.2
1.3	1.4
1.5	1.6
1.7	1.8
1.9	1.10
1.11	1.12
1.13	1.14
1.15	ZP
UP	

AH32AN02P-5B



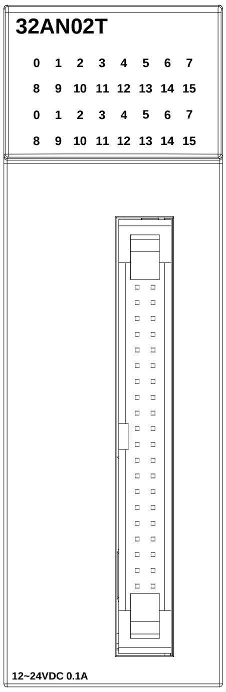
AH32AN02P-5B	
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
ZP	ZP
UP	1.0
1.1	1.2
1.3	1.4
1.5	1.6
1.7	1.8
1.9	1.10
1.11	1.12
1.13	1.14
1.15	ZP
UP	

AH32AM10N-5C



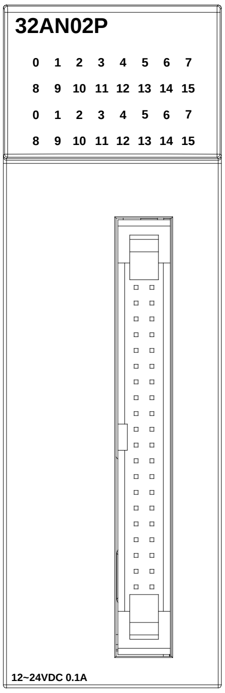
AH32AM10N-5C	
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
S/S	S/S
1.0	1.1
1.2	1.3
1.4	1.5
1.6	1.7
1.8	1.9
1.10	1.11
1.12	1.13
1.14	1.15
S/S	S/S

AH32AN02T-5C



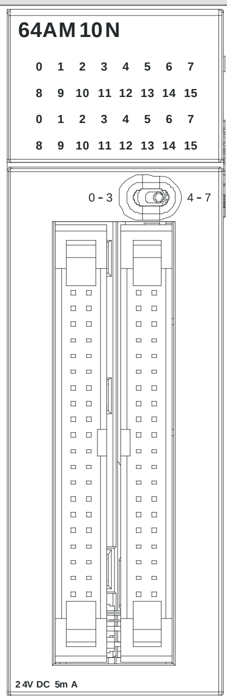
AH32AN02T-5C	
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
ZP	ZP
UP	UP
1.0	1.1
1.2	1.3
1.4	1.5
1.6	1.7
1.8	1.9
1.10	1.11
1.12	1.13
1.14	1.15
ZP	ZP
UP	UP

AH32AN02P-5C



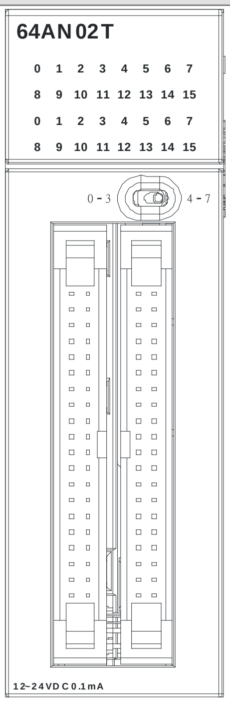
0.0	0.1
0.2	0.3
0.4	0.5
0.6	0.7
0.8	0.9
0.10	0.11
0.12	0.13
0.14	0.15
ZP	ZP
UP	UP
1.0	1.1
1.2	1.3
1.4	1.5
1.6	1.7
1.8	1.9
1.10	1.11
1.12	1.13
1.14	1.15
ZP	ZP
UP	UP

AH64AM10N-5C



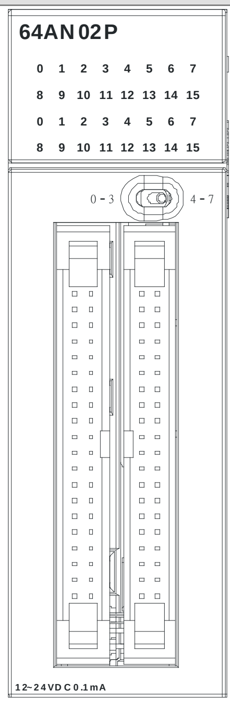
NC	NC	2.0	2.1
S/S	S/S	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	S/S	S/S
1.1	1.0	NC	NC
NC	NC	3.0	3.1
S/S	S/S	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9
0.9	0.8	3.10	3.11
0.7	0.6	3.12	3.13
0.5	0.4	3.14	3.15
0.3	0.2	S/S	S/S
0.1	0.0	NC	NC

AH64AN02T-5C



UP	UP	2.0	2.1
ZP	ZP	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	ZP	ZP
1.1	1.0	UP	UP
UP	UP	3.0	3.1
ZP	ZP	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9
0.9	0.8	3.10	3.11
0.7	0.6	3.12	3.13
0.5	0.4	3.14	3.15
0.3	0.2	ZP	ZP
0.1	0.0	UP	UP

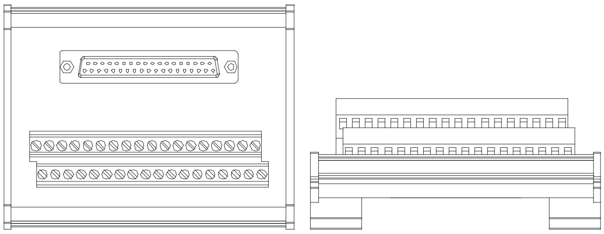
AH64AN02P-5C



UP	UP	2.0	2.1
ZP	ZP	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	ZP	ZP
1.1	1.0	UP	UP
UP	UP	3.0	3.1
ZP	ZP	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9
0.9	0.8	3.10	3.11
0.7	0.6	3.12	3.13
0.5	0.4	3.14	3.15
0.3	0.2	ZP	ZP
0.1	0.0	UP	UP

- **DB37 connector and the external terminal module**

1. External terminal module for AH32AM10N-5B: UB-10-ID32B

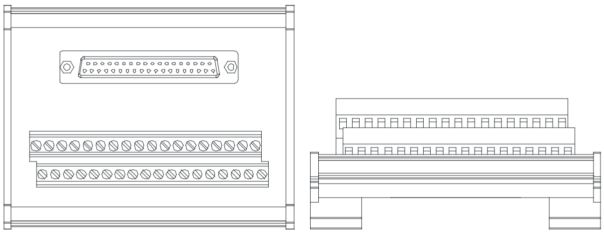


AH series terminals: (only applicable for AH series)

Upper row	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	X1.0	X1.2	X1.4	X1.6	X1.8	X1.10	X1.12	X1.14	S/S	S/S
Lower row	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	X1.1	X1.3	X1.5	X1.7	X1.9	X1.11	X1.13	X1.15	S/S	S/S

2. External terminal modules for AH32AN02T-5B

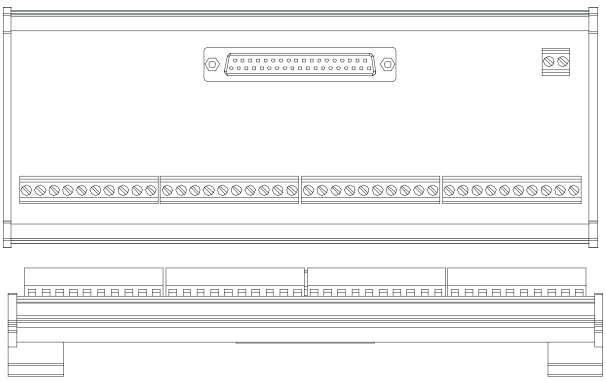
◆ UB-10-OT32B



AH series terminals: (only applicable for AH series)

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	UP	UP
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	ZP	ZP

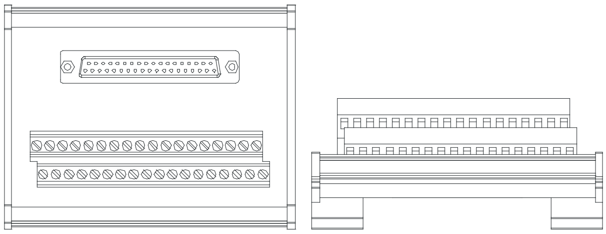
◆ UB-10-OR32A



AH series terminals: (only applicable for AH series)

																			GND	+24V
1st from the left	C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15
21st from the left	C4	Y1.0	Y1.1	Y1.2	Y1.3	C5	Y1.4	Y1.5	Y1.6	Y1.7	C6	Y1.8	Y1.9	Y1.10	Y1.11	C7	Y1.12	Y1.13	Y1.14	Y1.15

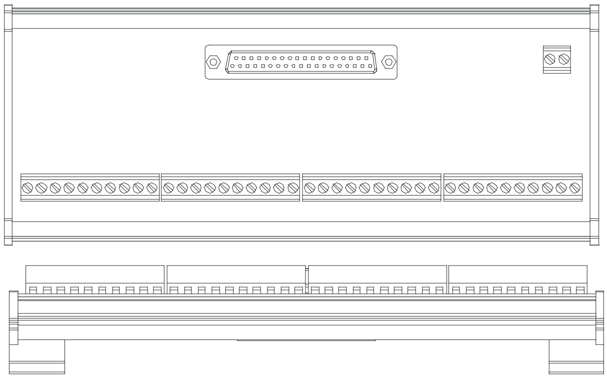
3. External terminal modules for AH32AN02P-5B
   - UB-10-OT32B



AH series terminals: (only applicable for AH series)

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	UP	UP
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	ZP	ZP

   - UB-10-OR32B

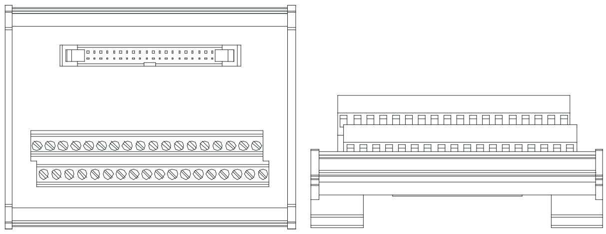


AH series terminals: (only applicable for AH series)

																		GND	+24V
1st from the left	C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15
21st from the left	C4	Y1.0	Y1.1	Y1.2	Y1.3	C5	Y1.4	Y1.5	Y1.6	Y1.7	C6	Y1.8	Y1.9	Y1.10	Y1.11	C7	Y1.12	Y1.13	Y1.14	Y1.15

- **Latch connector and external terminal module**

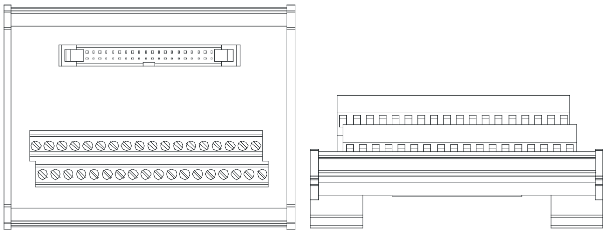
1. External terminal module for AH32AM10N-5C/AH64AM10N-5C: UB-10-ID32A



AH series terminals: (only applicable for AH series)

Upper row	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	X1.0	X1.2	X1.4	X1.6	X1.8	X1.10	X1.12	X1.14	S/S	S/S
Lower row	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	X1.1	X1.3	X1.5	X1.7	X1.9	X1.11	X1.13	X1.15	S/S	S/S

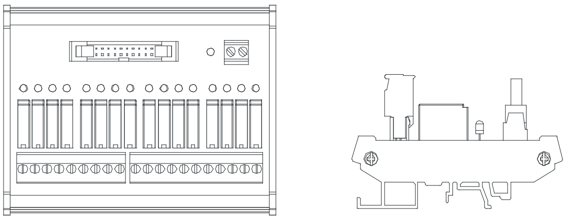
2. External terminal modules for AH32AN02T-5C/AH64AN02T-5C:
   - UB-10-OT32A



AH series terminals: (only applicable for AH series)

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	+24V	+24V
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	GND	GND

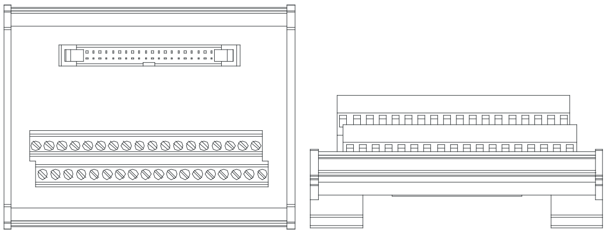
   - UB-10-OR16A



AH series terminals: (only applicable for AH series)

																		GND	+24V
C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15

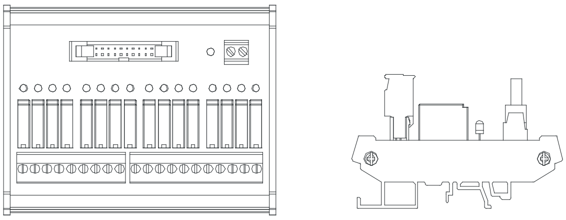
3. External terminal module for AH32AN02P-5C/AH64AN02P-5C:
   - UB-10-OT32A



AH series terminals: (only applicable for AH series)

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	+24V	+24V
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	GND	GND

   - UB-10-OR16B



AH series terminals: (only applicable for AH series)

																		GND	+24V
C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15

2.7 Specifications for Analog Input/Output Modules

2.7.1 General Specifications

- **AH04AD-5A/AH08AD-5A/AH08AD-5B/AH08AD-5C**

Electrical specifications

Module name	AH04AD-5A	AH08AD-5A	AH08AD-5B	AH08AD-5C
Number of inputs	4	8	8	8
Analog-to-digital conversion	Voltage input/ Current input	Voltage input/ Current input	Voltage input	Current input
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)			
Connector type	Removable terminal block			
Conversion time	150 μs/channel			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC			
Weight	200g			

Functional specifications

Analog-to-digital conversion	Voltage input				
Rated input range	-10 V~10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware input range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Fiducial error (Room temperature)	±0.1%				
Fiducial error (Full temperature range)	±0.45%				
Linearity error (Room temperature)	±0.07%				
Linearity error (Full temperature range)	±0.12%				
Hardware resolution	16 bits				
Input impedance	>1MΩ				
Absolute input range	±15 V				

Analog-to-digital conversion	Current input		
Rated input range	±20 mA	0 mA~20 mA	4 mA~20 mA
Hardware input range	-20.2 mA~20.2 mA	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature)	±0.1%		
Fiducial error (Full temperature range)	±0.2%		

Analog-to-digital conversion	Current input
Linearity error (Room temperature) (Full temperature range)	±0.05%
Linearity error	±0.23%
Hardware resolution	16 bits
Input impedance	250 Ω
Absolute input range	±32 mA

- **AH04DA-5A/ AH08DA-5A/AH08DA-5B/AH08DA-5C**

Electrical specifications

Module name	AH04DA-5A	AH08DA-5A	AH08DA-5B	AH08DA-5C
Number of outputs	4	8	8	8
Analog-to-digital conversion	Voltage output/ Current output	Voltage output/ Current outpu	Voltage output	Current output
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)			
Connector type	Removable terminal block			
Conversion time	150 μs/channel			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC			
Weight	210g			

Functional specifications

Analog-to-digital conversion	Voltage output				
Rated output range	±10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware output range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Fiducial error (Room temperature)	±0.02%				
Fiducial error (Full temperature range)	±0.04%				
Linearity error (Room temperature)	±0.004%				
Linearity error (Full temperature range)	±0.004%				
Hardware resolution	16 bits				
Permissible load impedance	1 kΩ~2 MΩ: ±10 V and 0 V~10 V >=500 Ω: 1 V~5 V				

Analog-to-digital conversion	Current output	
Rated output range	0 mA~20 mA	4 mA~20 mA
Hardware output range	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature)	±0.06%	
Fiducial error (Full temperature range)	±0.07%	
Linearity error (Room temperature)	±0.01%	
Linearity error (Full temperature range)	±0.01%	
Hardware resolution	16 bits	
Permissible load impedance	<= 550 Ω	

- **AH06XA-5A**

Electrical specifications

Module name	AH06XA-5A
Number of inputs	4
Number of outputs	2
Analog-to-digital conversion	Voltage input/Current input/Voltage output/Current output
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Conversion time	150 us/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC
Weight	210g

Functional specifications for the analog-to-digital conversion

Analog-to-digital conversion	Voltage input				
Rated input range	-10 V~10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware input range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Fiducial error (Room temperature)	±0.1%				
Fiducial error (Full temperature range)	±0.45%				

Linearity error (Room temperature)	±0.07%
Linearity error (Full temperature range)	±0.12%
Hardware resolution	16 bits
Input impedance	>1MΩ
Absolute input range	±15 V

Analog-to-digital conversion	**Current input**		
Rated input range	±20 mA	0 mA~20 mA	4 mA~20 mA
Hardware input range	-20.2 mA~20.2 mA	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature)	±0.1%		
Fiducial error (Full temperature range)	±0.2%		
Linearity error (Room temperature)	±0.05%		
Linearity error (Full temperature range)	±0.23%		
Hardware resolution	16 bits		
Input impedance	250 Ω		
Absolute input range	±32 mA		

Functional specifications for the digital-to-analog conversion

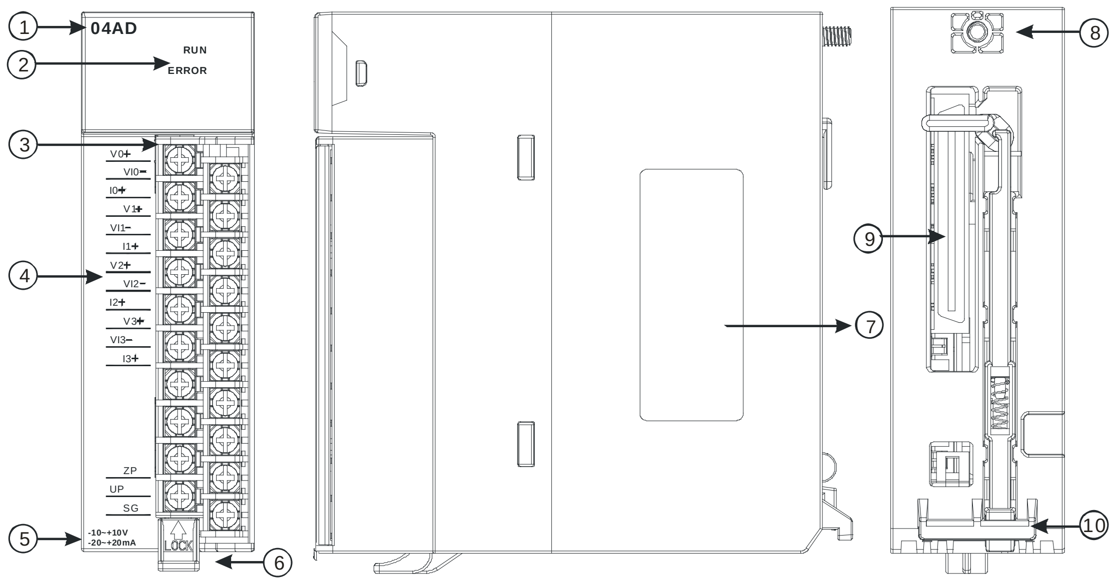
Digital-to-analog conversion	**Voltage output**				
Rated output range	±10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware output range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Fiducial error (Room temperature)	±0.02%				
Fiducial error (Full temperature range)	±0.04%				
Linearity error (Room temperature)	±0.004%				
Linearity error (Full temperature range)	±0.004%				
Hardware	16 bits				

resolution	
Permissible load impedance	1 kΩ~2 MΩ: ±10 V and 0 V~10 V >= 500 Ω: 1 V~5 V

Digital-to-analog conversion	**Current output**	
Rated output range	0 mA~20 mA	4 mA~20 mA
Hardware output range	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature)	±0.06%	
Fiducial error (Full temperature range)	±0.07%	
Linearity error (Room temperature)	±0.01%	
Linearity error (Full temperature range)	±0.01%	
Hardware resolution	16 bits	
Permissible load impedance	<= 550 Ω	

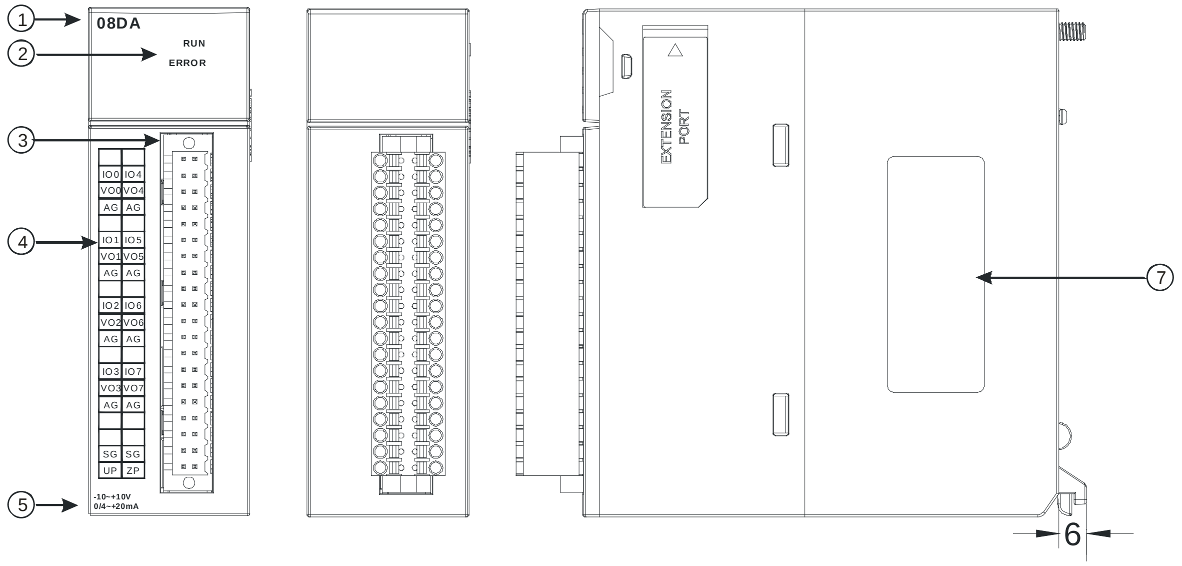
2.7.2 Profiles

- **AH04AD-5A/AH08AD-5B/AH08AD-5C/AH04DA-5A/AH08DA-5B/AH08DA-5C/AH06XA-5A**



Unit: mm

- **AH08AD-5A/AH08DA-5A**

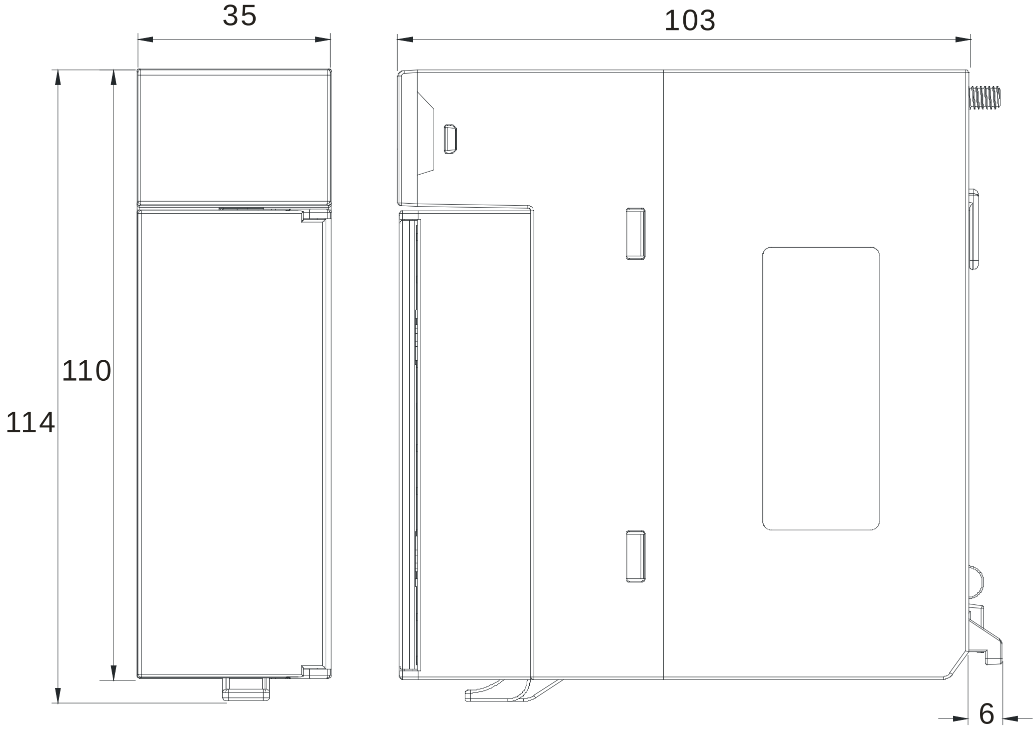


Unit: mm

Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running.
2	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Description of the inputs/outputs	Simple specifications for the module
6	Clip	Removing the terminal block
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

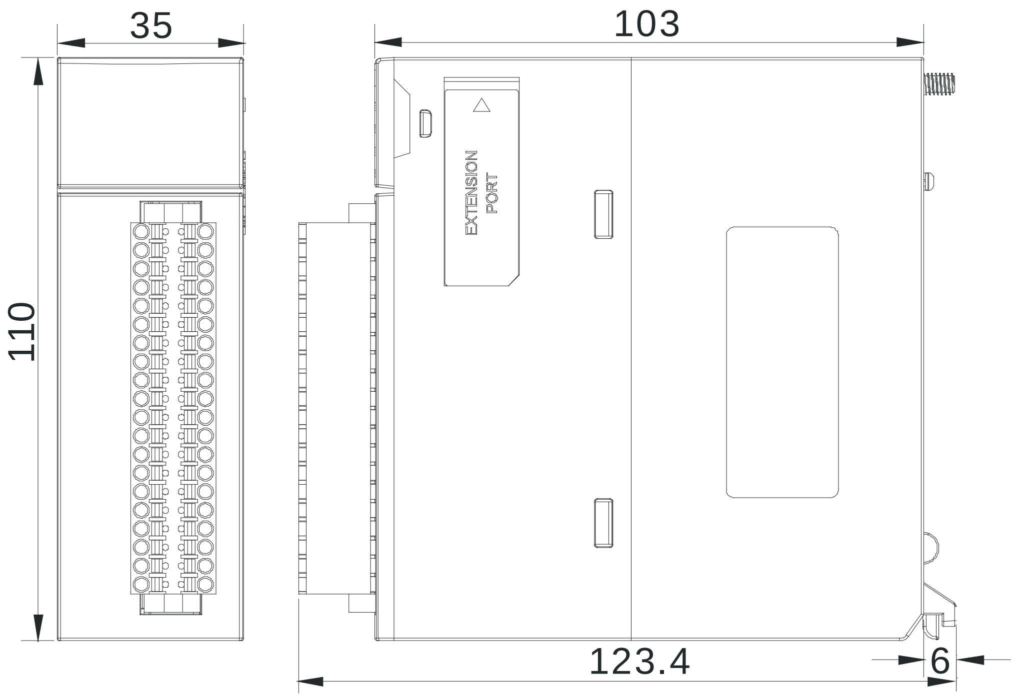
2.7.3 Dimensions

- **AH04AD-5A/AH08AD-5B/AH08AD-5C/AH04DA-5A/AH08DA-5B/AH08DA-5C/AH06XA-5A**



Unit: mm

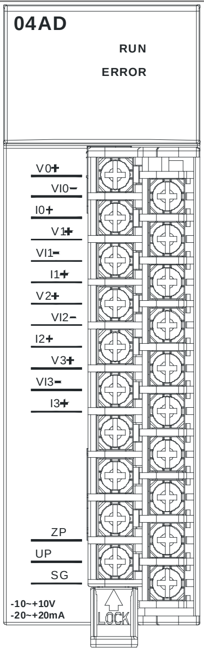
- **AH08AD-5A/AH08DA-5A**



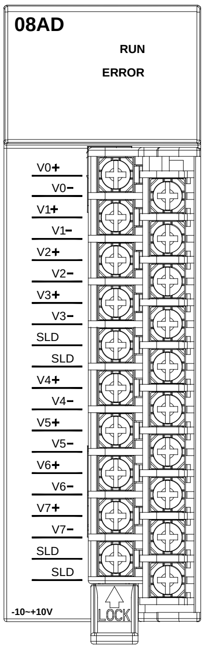
Unit: mm

2.7.4 Arrangement of Input/Output Terminals

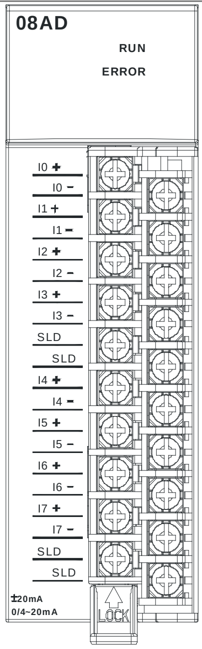
AH04AD-5A



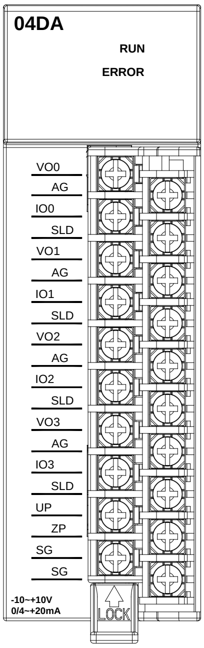
AH08AD-5A



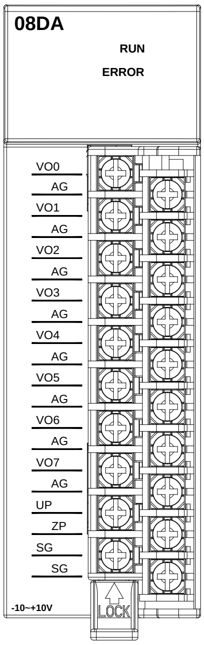
AH08AD-5B



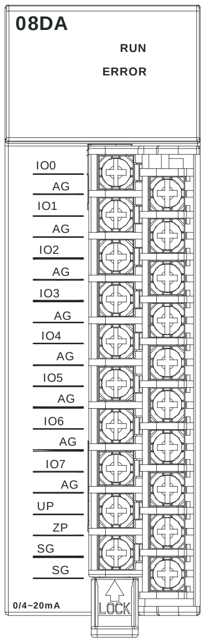
AH08AD-5C

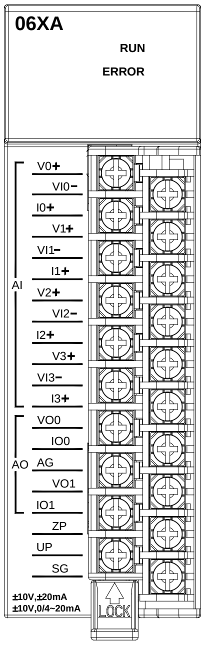
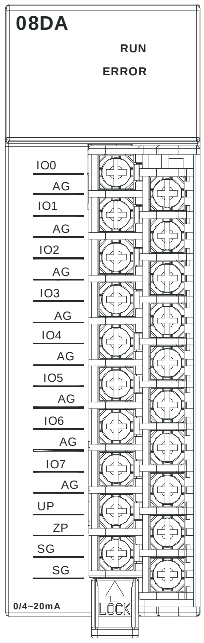
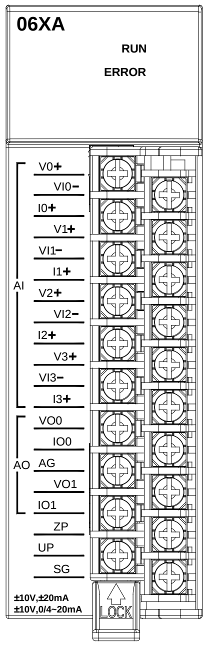


AH04AD-5A



AH08AD-5A



AH08DA-5B	AH08DA-5C	AH06XA-5A
		

2.8 Specifications for Temperature Measurement Modules

2.8.1 General Specifications

- **AH04PT-5A**

Electrical specifications

Number of analog inputs	4
Applicable sensor	Three-wire configuration: Pt100/Ni100/Pt1000/Ni1000, and 0~300 Ω input impedance Two-wire/Four-wire configuration: Pt100/Ni100/Pt1000/Ni1000, and 0~300 Ω input impedance Pt100: DIN 43760-1980 JIS C1604-1989; 100 Ω 3850 PPM/°C Pt1000: DIN EN60751; 1 kΩ 3850 PPM/°C Ni100/Ni1000: DIN 43760
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Overall accuracy	25°C/77°F: The error is ±0.5% of the input within the range. -20~60°C/-4~140°F: The error is ±1% of the input within the range.
Conversion time	Two-wire/Four-wire configuration: 150 ms/channel Three-wire configuration: 300 ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC
Weight	195g

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Rated input range	Pt100: -180°C~800°C Ni100: -80°C~170°C Pt1000: -180°C~800°C Ni1000: -80°C~170°C	Pt100: -292°F~1,472°F Ni100: -112°F~338°F Pt1000: -292°F~1,472°F Ni1000: -112°F~338°F	0~300 Ω
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

- **AH08PTG-5A**

Electrical specifications

Number of analog inputs	8
Applicable sensor	Three-wire configuration: Pt100/Ni100/Pt1000/Ni1000 sensor, and 0~300 Ω input impedance Two-wire/Four-wire configuration: Pt100/Ni100/Pt1000/Ni1000 sensor, and 0~300 Ω input impedance Pt100: DIN 43760-1980 JIS C1604-1989; 100 Ω 3850 PPM/°C Pt1000: DIN EN60751; 1 kΩ 3850 PPM/°C Ni100/Ni1000: DIN 43760
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Overall accuracy	The error is ±1°C of a Pt100/Pt1000/Ni100/Ni1000 sensor's temperature. The error is ±0.1% of a resistance in the range of 0 Ω to 300 Ω.
Conversion time	● Quick mode: Four-wire/Two-wire configuration: 20 ms/channel Three-wire configuration: 200 ms/channel ● General mode: A conversion time will be gotten after the conversion time of the two channels in a group is added up. Four-wire/Two-wire configuration: 200 ms/channel Three-wire configuration: 400 ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between two group circuits: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC
Weight	255g

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Rated input range	Pt100: -180°C~800°C Ni100: -80°C~170°C Pt1000: -180°C~800°C Ni1000: -80°C~170°C	Pt100: -292°F~1,472°F Ni100: -112°F~338°F Pt1000: -292°F~1,472°F Ni1000: -112°F~338°F	0~300 Ω
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

- **AH04TC-5A/AH08TC-5A**

Electrical specifications

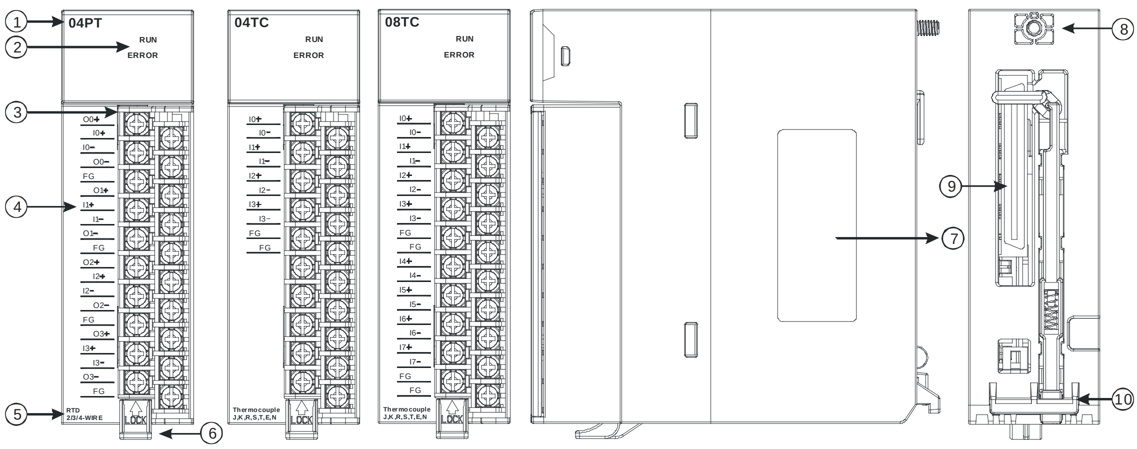
Module name	AH04TC-5A	AH08TC-5A
Number of analog inputs	4	8
Applicable sensor	Type J, type K, type R, type S, type T, type E, and type N thermocouples ±150 mV voltage inputs	
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)	
Connector type	Removable terminal block	
Overall accuracy	25°C/77°F: The error is ±0.5% of the input within the range -20~60°C/-4~140°F: The error is ±1% of the input within the range	
Conversion time	200 ms/channel	
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC Isolation between analog channels: 120 VAC	
Weight	190g	

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Voltage input
Rated input range	Type J: -100°C~1,150°C Type K: -100°C~1,350°C Type R: 0°C~1,750°C Type S: 0°C~1,750°C Type T: -150°C~390°C Type E: -150°C~980°C Type N: -150°C~1,280°C	Type J: -148°F~2,102°F Type K: -148°F~2,462°F Type R: 32°F~3,182°F Type S: 32°F~3,182°F Type T: -238°F~734°F Type E: -238°F~1,796°F Type N: -238°F~2,336°F	±150 mV
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

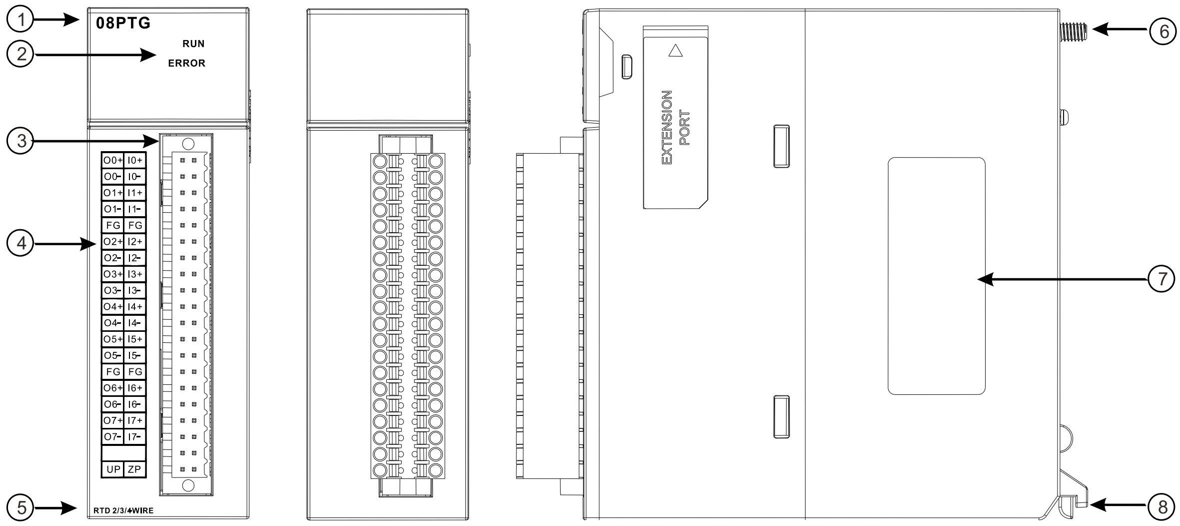
2.8.2 Profiles

- **AH04PT-5A/AH04TC-5A/AH08TC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
3	Removable terminal block	The inputs are connected to a sensor.
4	Arrangement of the input terminals	Arrangement of the terminals
5	Description of the inputs	Simple specifications for the module
6	Clip	Removing the terminal block
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

- **AH08PTG-5A**

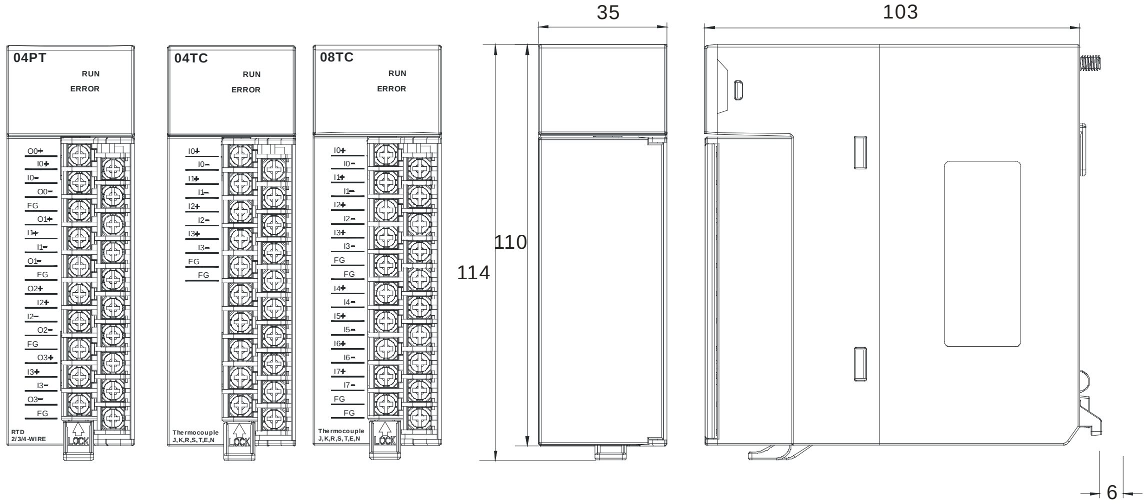


Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
3	Removable terminal block	The inputs are connected to a sensor.
4	Arrangement of the input terminals	Arrangement of the terminals
5	Description of the inputs	Simple specifications for the module
6	Set screw	Fixing the module

Number	Name	Description
7	Label	Nameplate
8	Projection	Fixing the module

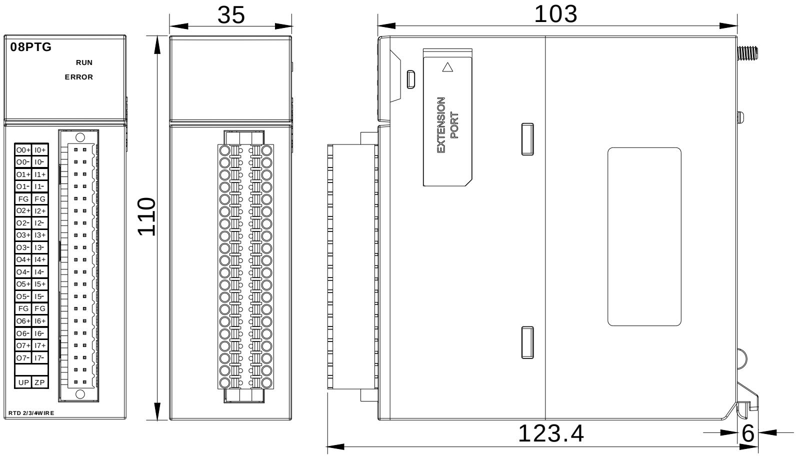
2.8.3 Dimensions

- **AH04PT-5A/AH04TC-5A/AH08TC-5A**



Unit: mm

- **AH08PTG-5A**



Unit: mm

2.8.4 Arrangement of Input/Output Terminals

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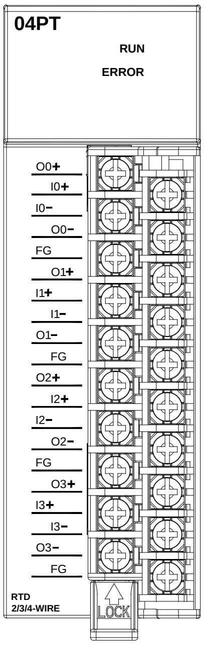
<tr><td>
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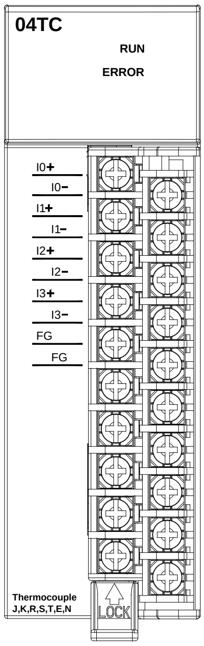
<td>
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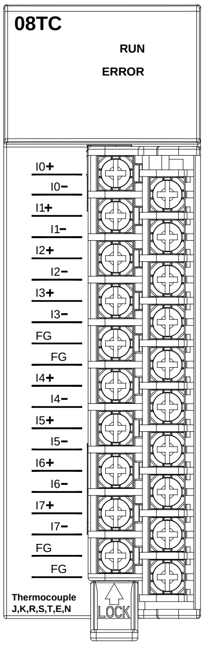
<tr><th>AH08TC-5A</th><th>AH08PTG-5A</th></tr>
<tr><td>
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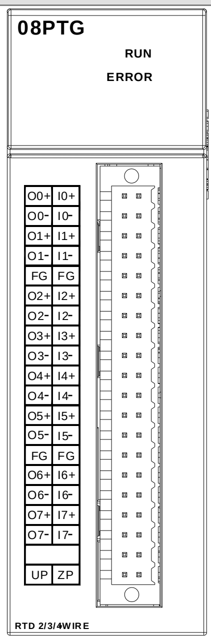
<td>
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2.9 Specifications for Network Modules

2.9.1 General Specifications

- **AH10SCM-5A**

RS-485/RS-422 communication interface

Item	Specifications
Connector type	European-style terminal block
Transmission speed	1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 76,800, 115,200, 230,400, and 460,800 bps
Communication format	Stop bit: 1 stop bit or 2 stop bits Parity bit: none, an odd parity bit, or an even parity bit Data bit: 7 data bits or 8 data bits
Communication protocol	Modbus ASCII/RTU UD Link BACnet MS/TP slave stations

Electrical specifications

Item	Specifications
Supply voltage	5 VDC
Electronical isolation	500 VAC
Weight	131g

- **AH15SCM-5A**

RS-232 communication interface

Item	Specifications
Connector type	DB9 connector
Transmission speed	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800 and 115200 bps
Communication format	Stop bit: 1 stop bit or 2 stop bits Parity bit: none, an odd parity bit, or an even parity bit Data bit: 7 data bits or 8 data bits
Communication protocol	Modbus ASCII/RTU UD Link BACnet MS/TP slave stations

Electrical specifications

Item	Specifications
Supply voltage	5 VDC
Electronical isolation	500 VAC
Weight	150g

- **AH10EN-5A / AH15EN-5A**

Network interface

Item	Specifications
Connector type	RJ-45 with auto-MDI/MDIX
Transmission interface	802.3 and 802.3u
Transmission cable	Category 5e cable The maximum length is 100 meters.
Transmission speed	10/100 Mbps auto-detection

AH10EN-5A network protocol supported

Communication protocol	ICMP, IP, TCP, UDP, DHCP, NTP, Modbus TCP, SNMP, SMTP, and EtherNet/IP

AH15EN-5A network protocol supported

Communication protocol	ICMP, IP, TCP, UDP, DHCP, NTP, Modbus TCP, SNMP, SMTP, and IEC60870-5-104

Electrical specifications

Item	Specifications
Supply voltage	5 VDC
Electronical isolation	1500 VAC
Weight	139 g

- **AH10DNET-5A**

AH500 series CPU modules which are supported

Item	Specifications
Model name	AH500 series PLCs

DeviceNet interface

Item	Specifications
Transmission method	CAN
Electrical isolation	500 VAC
Connector	Removable connector (5.08 mm)
Communication cable	The Delta standard cables UC-DN01Z-01A and UC-DN01Z-02A are recommended. The communication cable should be away from the power cable and the shielded cable should be connected to the ground.
Voltage	DeviceNet network provides 11~25 V direct current. e.g. 28 mA (Typical value), 125 mA impulse current (24 VDC).

DeviceNet Communication

Item	Specifications
Message type	Master mode: Supporting explicit messages, and all kinds of I/O connections with the slave such as I/O polled connections, bit-strobed connections, state changing connections, and cyclic connections Slave mode: Supporting explicit messages and a group 2 only server
Transmission speed	Standard: 125 kbps, 250 kbps and 500 kbps Extension: 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps and 1 Mbps
Weight	135g

- **AH10PFBM-5A**

AH500 series CPU module supported

Item	Specifications
Model name	AH500 series PLCs

PROFIBUS-DP interface

Item	Specifications
Interface	DB9 connector
Transmission method	High-speed RS-485
Transmission cable	Two-wire twisted shielded cable

PROFIBUS-DP communication

Item	Specifications
Message type	Cyclic data exchange
Module name	AH10PFBM-5A

Product ID	0B49
Serial transmission speed supported (auto-detection)	9.6 kbps; 19.2 kbps; 31.25 kpbs;45.45 kbps;93.75 kbps; 187.5 kbps; 500 kbps; 1.5 Mbps; 3 Mbps; 6 Mbps; 12 Mbps

Electrical specification

Item	Specifications
Power supply voltage	5 VDC
Electronical isolation	500 VAC
Weight	190 g

- **AH10PFBS-5A**

PROFIBUS-DP port

Interface	DB9 connector
Transmission method	High-speed RS-485
Transmission cable	Shielded twisted pair cable

Communication

Message type	Cyclic data exchange
Module name	AH10PFBS-5A
GSD file	DELA0AFE.GSD
Product ID	0AFE
Serial transmission speed supported (auto-detection)	9.6 kbps; 19.2 kbps; 45.45 (31.25) kbps; 93.75 kbps; 187.5 kbps; 500 kbps; 1.5 Mbps; 3 Mbps; 6 Mbps; 12 Mbps

Electrical specification

Power supply voltage	5 VDC
Electronical isolation	500 VAC
Weight	115g

- **AH10COPM-5A**

CANopen interface

Item	Specifications
Transmission method	CAN
Connector	Removable connector (5.08 mm)
Communication cable	It is suggested that users should use the Delta standard cables UC-DN01Z-01A and UC-DN01Z-02A. The communication cable used should be away from the power cable used, and the shielded cables used should be connected to the ground.

CANopen communication

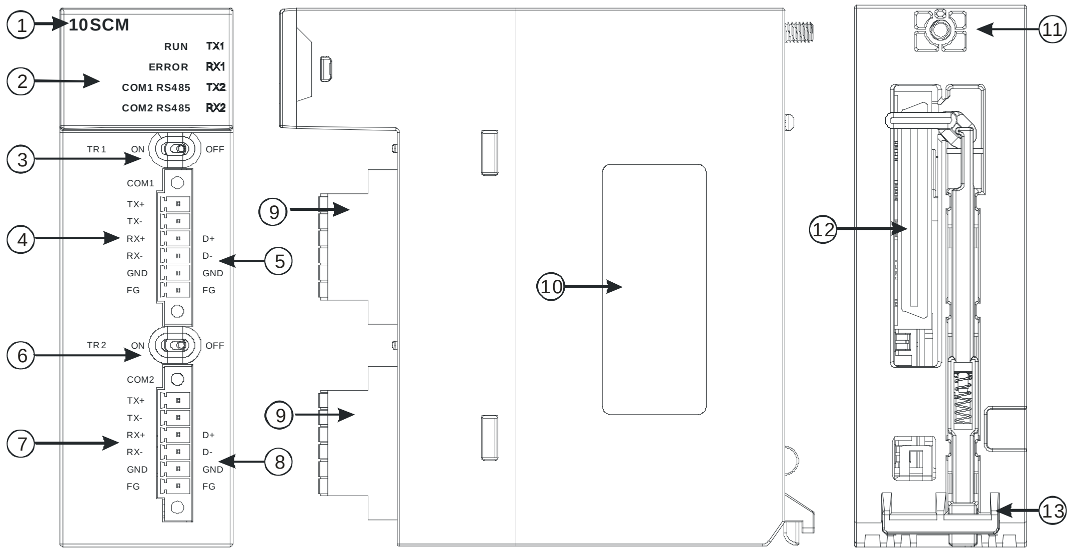
Item	Specifications
Message type	PDO, SDO, SYNC, EMCY, NMT
Transmission speed	10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps

Electrical specifications

Item	Specifications
Supply voltage	A CPU module supplies 24 VDC (-15%~20%) power through an internal bus.
Electronical isolation	500 VAC
Weight	150g

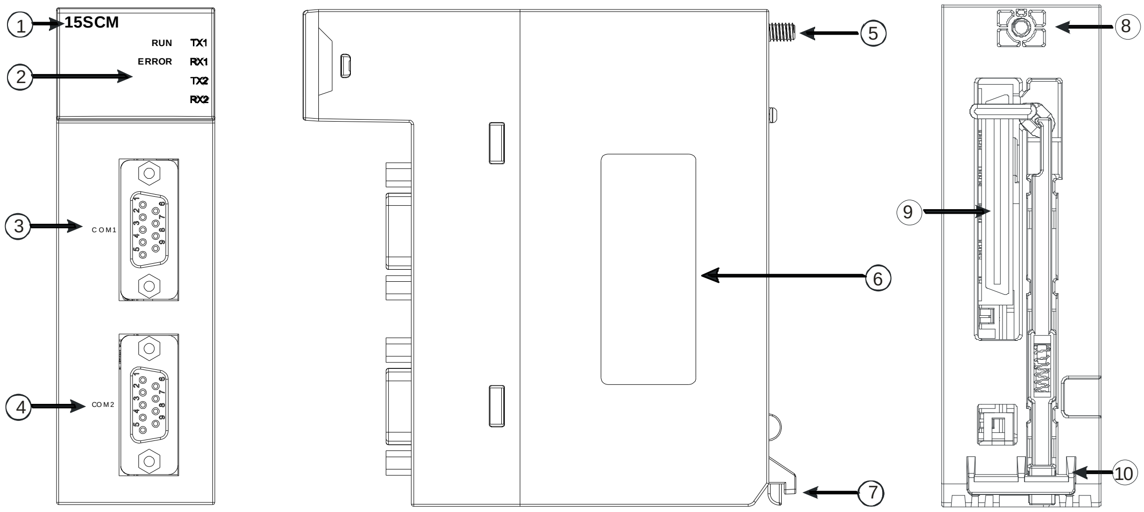
2.9.2 Profiles

- **AH10SCM-5A**



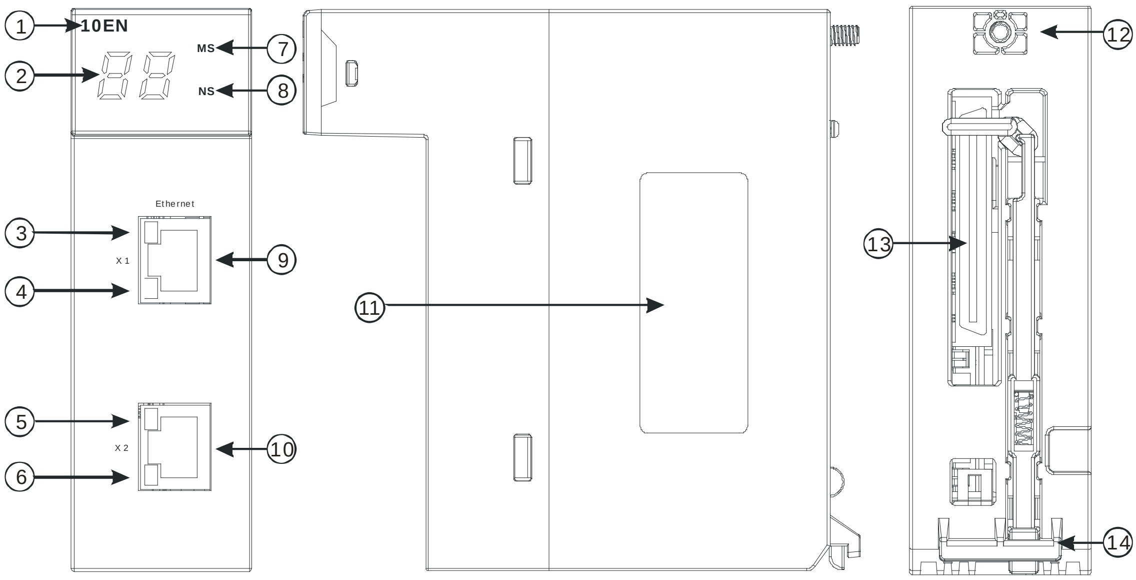
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator (red)	Error status of the module ON: There is a hardware error. OFF: The module is normal. Blinking: 1. The setting of the module is incorrect, or there is a communication error. 2. Restoring the module to the default factory value
	COM1 (RS-485) LED indicator (green)	ON: RS-485 mode OFF: RS-422 mode
	COM2 (RS-485) LED indicator (green)	ON: RS-485 mode OFF: RS-422 mode
	TX1/TX2 LED indicator (orange)	Blinking: The data is being transmitted through the RS-485/RS422 port. OFF: The data is not being transmitted through the RS-485/RS422 port.
	RX1/RX2 LED indicator (orange)	Blinking: The data is being reveived through the RS-485/RS422 port. OFF: The data is not being reveived through the RS-485/RS422 port.
3	Switch of terminal resistor 1	Switching terminal resistor 1 ON/OFF
4	Terminals	Terminals for COM1 (RS-422)
5	Terminals	Terminals for COM1 (RS-485)
6	Switch of terminal resistor 2	Switching terminal resistor 2 ON/OFF
7	Terminals	Terminals for COM2 (RS-422)
8	Terminals	Terminals for COM2 (RS-485)
9	European-style terminal block	Terminals for wiring
10	Label	Nameplate
11	Set screw	Fixing the module
12	Connector	Connecting the module and a backplane
13	Projection	Fixing the module

- **AH15SCM-5A**



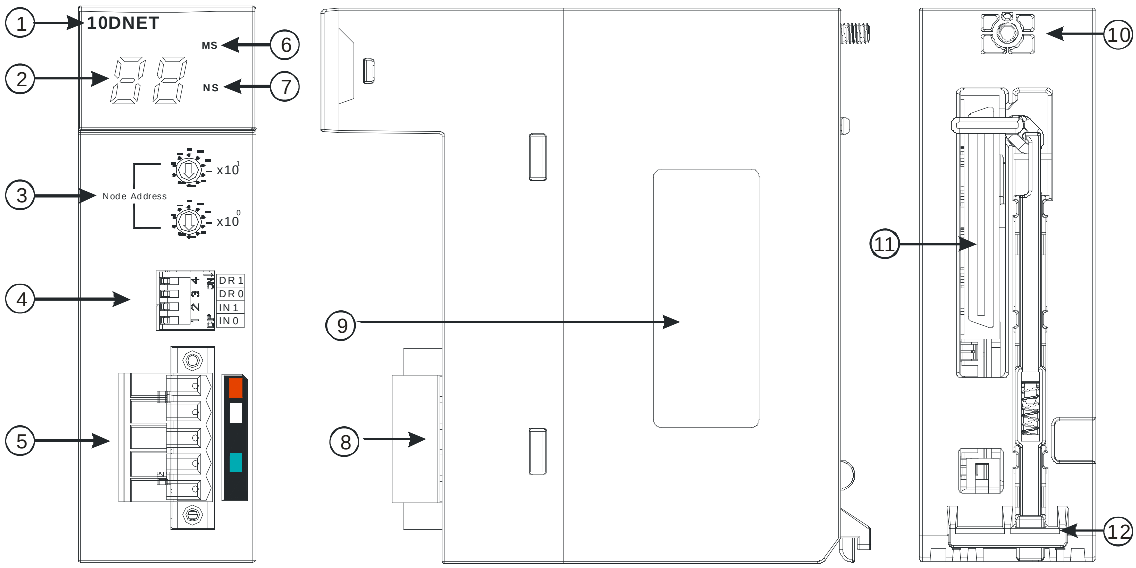
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
	ERROR LED indicator (red)	Error status of the module ON: There is a hardware error. OFF: The module is normal. Blinking: 1. The setting of the module is incorrect, or there is a communication error. 2. Restoring the module to the default factory value
	COM1 (RS-485) LED indicator (green)	ON: RS-485 mode OFF: RS-422 mode
	COM2 (RS-485) LED indicator (green)	ON: RS-485 mode OFF: RS-422 mode
	TX1/TX2 LED indicator (orange)	Blinking: The data is being transmitted through the RS-232 port. OFF: The data is not being transmitted through the RS-232 port.
	RX1/RX2 LED indicator (orange)	Blinking: The data is being reveived through the RS-232 port. OFF: The data is not being reveived through the RS-232 port.
3	Terminals	Terminals for COM1 (RS-232)
4	Terminals	Terminals for COM2 (RS-232)
5	Set screw	Fixing the module
6	Label	Nameplate
7	Projection	Fixing the module
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

- **AH10EN-5A / AH15EN-5A**



Number	Name	Description
1	Model name	Model name of the module
2	Seven-segment display	Display
3	LINK LED indicator	LINK LED indicator for RJ45 port 1
4	ACK LED indicator	ACK LED indicator for RJ45 port 1
5	LINK LED indicator	LINK LED indicator for RJ45 port 2
6	ACK LED indicator	ACK LED indicator for RJ45 port 2
7	NS LED indicator	LED indicator
8	MS LED indicator	LED indicator
9	RJ45 port 1	RJ45 port 1
10	RJ45 port 2	RJ45 port 2
11	Label	Nameplate
12	Set screw	Fixing the module
13	Connector	Connecting the module and a backplane
14	Projection	Fixing the module

- **AH10DNET-5A**

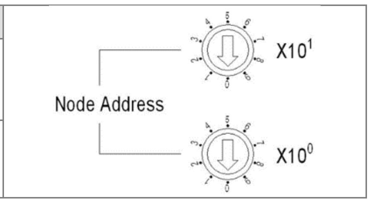


Number	Name	Description
1	Model name	Model name of the module
2	Seven-segment display	Display
3	Address knobs	Setting the address
4	Function switch	Setting the functions
5	DeviceNet connector	DeviceNet is used to interconnect control devices for data exchange.
6	MS LED indicator	Indicating the status of the module
7	NS LED indicator	Indicating the status of the network
8	Removable terminal block	Terminals for wiring
9	Label	Nameplate
10	Set screw	Fixing the module
11	Connector	Connecting the module and a backplane.
12	Projection	Fixing the module

1. Address knobs

It is used to set the node address of AH10DNET-5A on a DeviceNet network. (Node addresses range from 0 to 63.)

Setting	Description
0…63	Available nodes on a DeviceNet network
64…99	Unavailable nodes on a DeviceNet network



Example: If users want to set the communication address of AH10DNET-5A to 26, they can turn the knob corresponding to x10^1 to 2, and turn the knob corresponding to x10^0 to 6.

Points for attention:

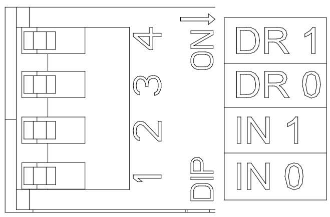
- When the power supply is cut off, the node address is set. After the setting of the node address is complete, AH10DNET-5A can be supplied with power.
- If AH10DNET-5A is running, changing the node address is unavailable.
- Please use a slotted screwdriver to turn the knobs with care, and do not scrape them.

2. **Function switch**

The function switch provides the following functions:

- Setting the working mode (IN 0)
- Setting the transmission speed of a DeviceNet network (DR 0~DR 1)

DR 1	DR 0	Transmission speed
OFF	OFF	125 kbps
OFF	ON	250 kbps
ON	OFF	500 kbps
ON	ON	Entering the extendable serial transmission speed mode
IN 1	Reserved	
IN 0	ON	If the slave is disconnected, the previous I/O data is retained.
	OFF	If the slave is disconnected, the previous I/O data is cleared.

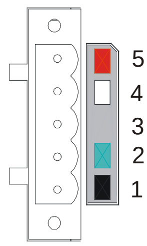


Points for attention:

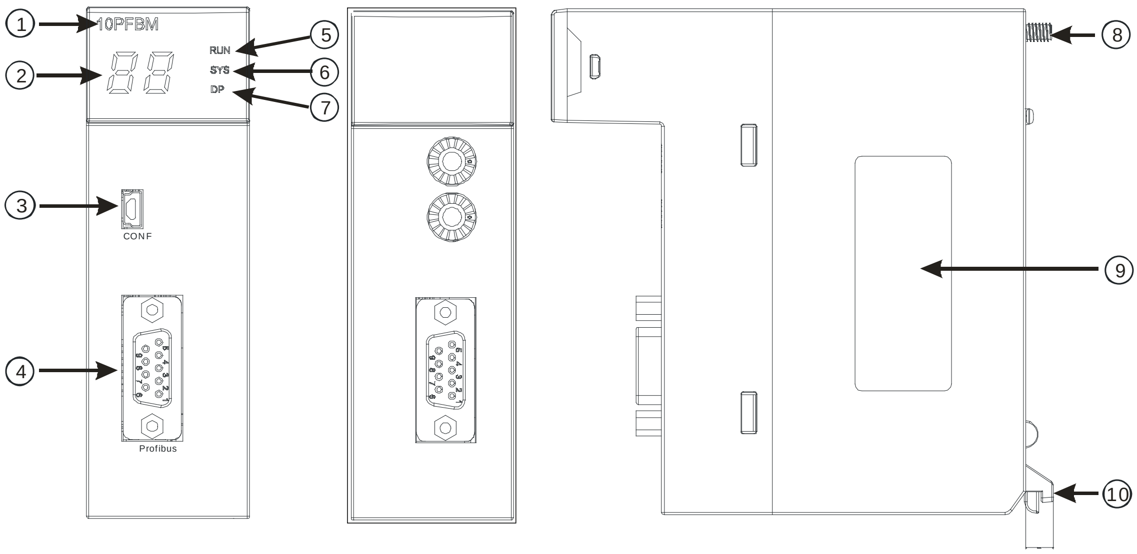
- When the power supply is cut off, the functions are set. After the setting of the functions is complete, AH10DNET-5A can be supplied with power.
- If AH10DNET-5A is running, changing the functions is unavailable.
- Please use a slotted screwdriver to adjust the DIP switch with care, and do not scrape them.

3. **DeviceNet connector**

Pin	Signal	Color	Description
5	V+	Red	24 VDC
4	CAN_H	White	Signal (positive pole)
3	SHIELD	-	It is connected to a shielded cable.
2	CAN_L	Blue	Signal (negative pole)
1	V-	Black	0 VDC



- **AH10PFBM-5A**



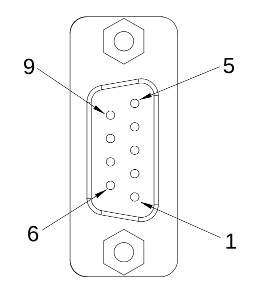
Number	Name	Description
1	Model name	Model name of the module
2	Seven-segment display	Display
3	CONF interface	The interface where the hardware configuration is

Number	Name	Description
		downloaded
4	PROFIBUS-DP interface	PROFIBUS-DP connection
5	RUN LED indicator	LED indicator indicator
6	SYS LED indicator	LED indicator indicator
7	DP LED indicator	LED indicator indicator
8	Set screw	Fixing the module
9	Label	Nameplate
10	Projection	Fixing the module

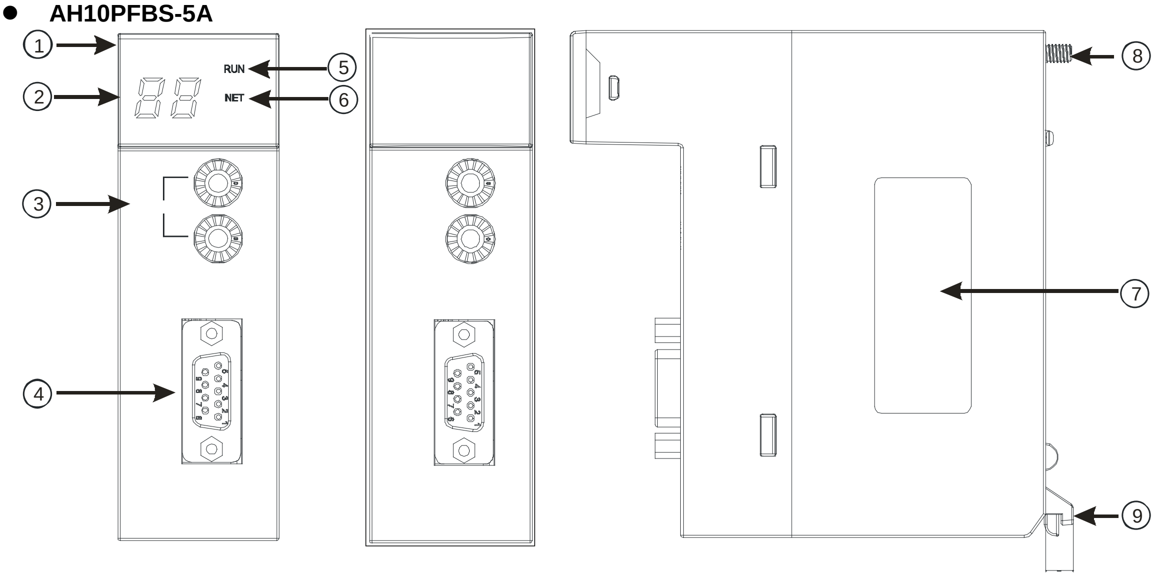
1. **PROFIBUS-DP port**

   A PROFIBUS-DP port is used to connect a module to a PROFIBUS-DP network. Users can wire AH10PFBM-5A by using the connector attached to AH10PFBM-5A.

Pin	PIN name	Description
1	--	N/C
2	--	N/C
3	RxD/TxD-P	Receiving/Sending data (P (B))
4	--	N/C
5	DGND	Data reference potential (C)
6	VP	Supplying positive voltage
7	--	N/C
8	RxD/TxD-N	Receiving/Sending data (N (A))
9	--	N/C



- **AH10PFBS-5A**

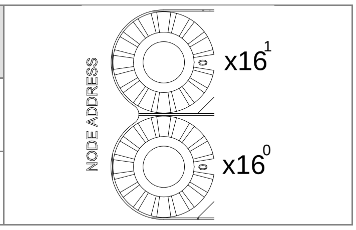


Number	Name	Description
1	Model name	Model name of the module
2	Seven-segment display	Display
3	Address knobs	Setting the address
4	PROFIBUS-DP interface	PROFIBUS-DP connection
5	RUN LED indicator	Operating status of the module
6	NET LED indicator	Status of a network
7	Label	Nameplate
8	Set screw	Fixing the module
9	Projection	Fixing the module

2

1. Setting a PROFIBUS node address
   The address knobs of AH10PFBS-5A are used for setting the node address of AH10PFBS-5A on a PROFIBUS-DP network. There are two address knobs. They are a knob corresponding to x16^0, and a knob corresponding to x16^1. The range for one address knob is 0~F.
   The range for setting the node address is described below.

Address	Definition
H’1~H’7D	Valid PROFIBUS address
H’0 or H’7E~H’FF	Invalid PROFIBUS address



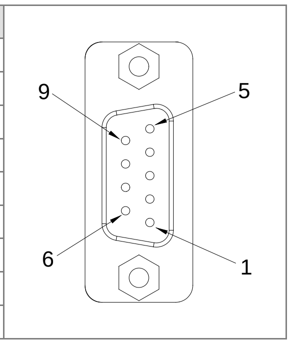
Example: If users need to set the node address of AH10PFBS-5A to 26 (decimal value), they have to turn the knob corresponding to x16^1 to “1”, and the knob corresponding to x16^0 to “A”.
26 (decimal value)=1A (hexadecimal value)=1x16^1+Ax16^0.

Points for attention:

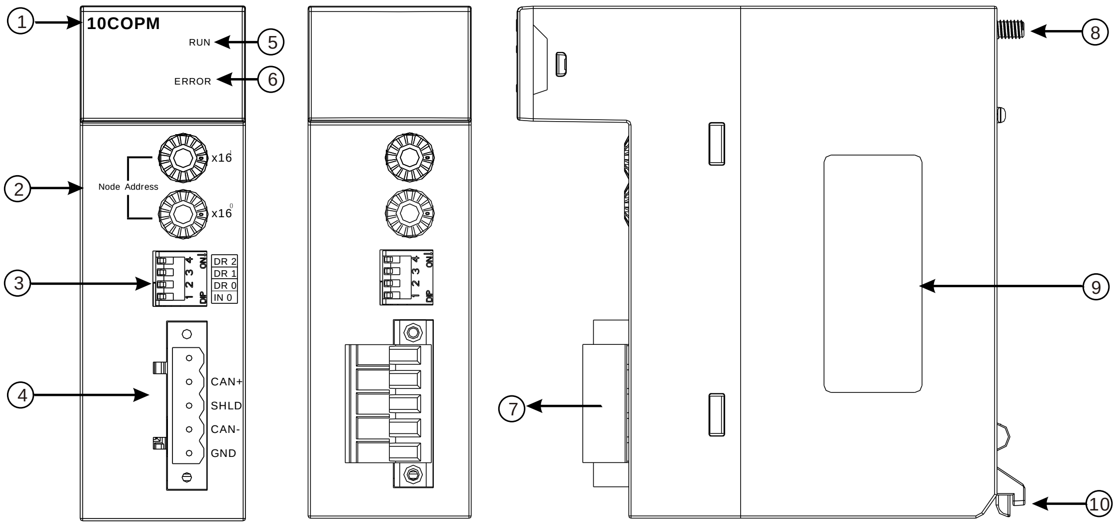
- If users set the node address of AH10PFBS-5A when AH10PFBS-5A is not supplied with power, they have to power AH10PFBS-5A after the node address of AH10PFBS-5A is set.
- If users change the node address of AH10PFBS-5A when AH10PFBS-5A is powered, the change will not take effect immediately after the node address of AH10PFBS-5A is changed, and it will take effect after the users cut off the power supplied to AH10PFBS-5A and then power AH10PFBS-5A again.
- To prevent the address knobs on AH10PFBS-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AH10PFBS-5A.

2. Definitions of the pins in the PROFIBUS-DP port

Pin	PIN name	Description
1	--	N/C
2	--	N/C
3	RxD/TxD-P	Sending/receiving data (P (B))
4	--	N/C
5	DGND	Data reference potential (C)
6	VP	Supplying positive voltage
7	--	N/C
8	RxD/TxD-N	Sending/receiving data (N (A))
9	--	N/C



- **AH10COPM-5A**

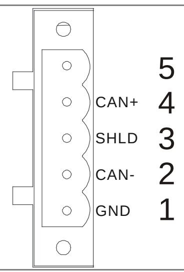


Number	Name	Description
1	Model name	Model name of the module
2	Address knobs	For setting an address
3	Function switch	For setting a function
4	CANopen connector	For a CANopen connection
5	RUN LED indicator	Operating status of the module
6	ERROR LED indicator	Error status of the module
7	Removable terminal block	Terminals
8	Set screw	Fixing the module
9	Label	Nameplate
10	Projection	Fixing the module

1. CANopen communication connector

A CANopen connector is connected to a CANopen network. Please wire AH10COPM-5A by using the connector attached to AH10COPM-5A.

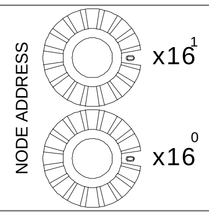
Pin	Signal	Description
5	-	Reserved
4	CAN+	CAN_H
3	SHLD	Shielded cable
2	CAN-	CAN_L
1	GND	0 VDC



2. Address knobs

The address knobs on AH10COPM-5A are used to set the node address of AH10COPM-5A on a CANopen network. Setting range: 1~7F (0 and 80~FF can not be used.)

Setting	Description
1~7F	Valid CANopen node address
0, 80~FF	Invalid CANopen node address



Example: If the station address of AH10COPM-5A is 16#26, users have to turn the knob corresponding to $x16^1$ to position 2, and turn the knob corresponding to $x16^0$ to position 6.

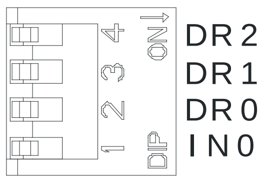
Points for attention:

- After the station address of AH10COPM-5A is changed, users have to power AH10COPM-5A again, otherwise the change will not take effect.
- To prevent the address knobs on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AH10COPM-5A.

3. **Function switch**

The function switch on AH10COPM-5A is used to set the communication speed at which AH10COPM-5A is connected to a CANopen network. There is a limit on the maximum communication distance to which a communication speed corresponds.

DR 2	DR 1	DR 0	Communication speed	Maximum communication distance
OFF	OFF	OFF	10 kbps	5000 m
OFF	OFF	ON	20 kbps	2500 m
OFF	ON	OFF	50 kbps	1000 m
OFF	ON	ON	125 kbps	500 m
ON	OFF	OFF	250 kbps	250 m
ON	OFF	ON	500 kbps	100 m
ON	ON	OFF	800 kbps	50 m
ON	ON	ON	1 Mbps	25 m
IN 0				Reserved

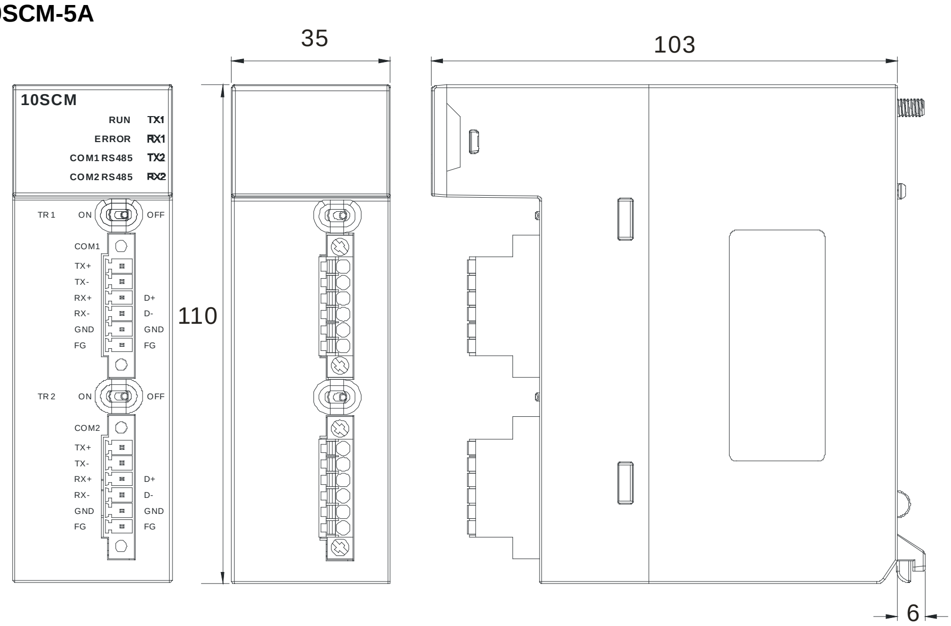


Points for attention:

- After users change the communication speed at which AH10COPM-5A is connected to a CANopen network, they have to power AH10COPM-5A again, otherwise the change will not take effect.
- To prevent the DIP switch on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the DIP switch on AH10COPM-5A.

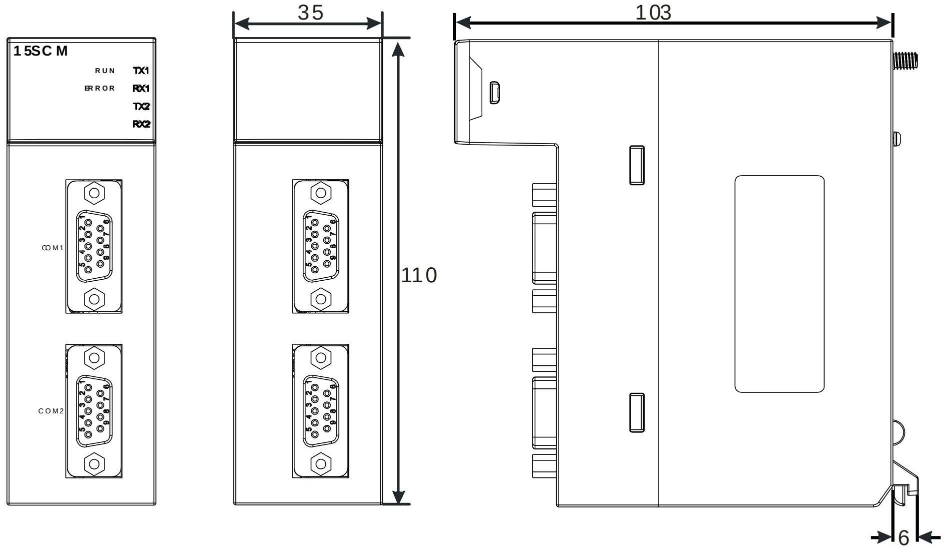
2.9.3 Dimensions

- **AH10SCM-5A**



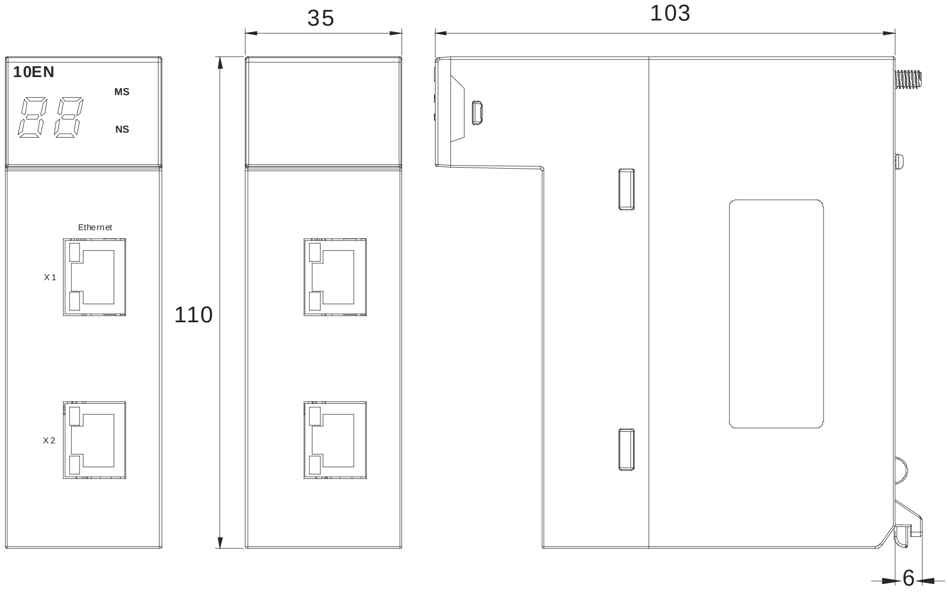
Unit: mm

- **AH15SCM-5A**



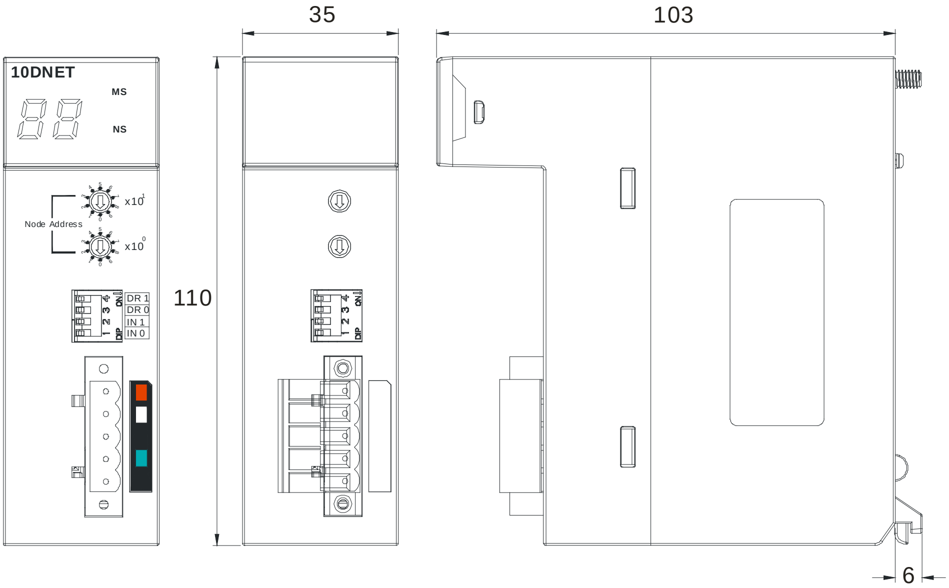
Unit: mm

- **AH10EN-5A / AH15EN-5A**



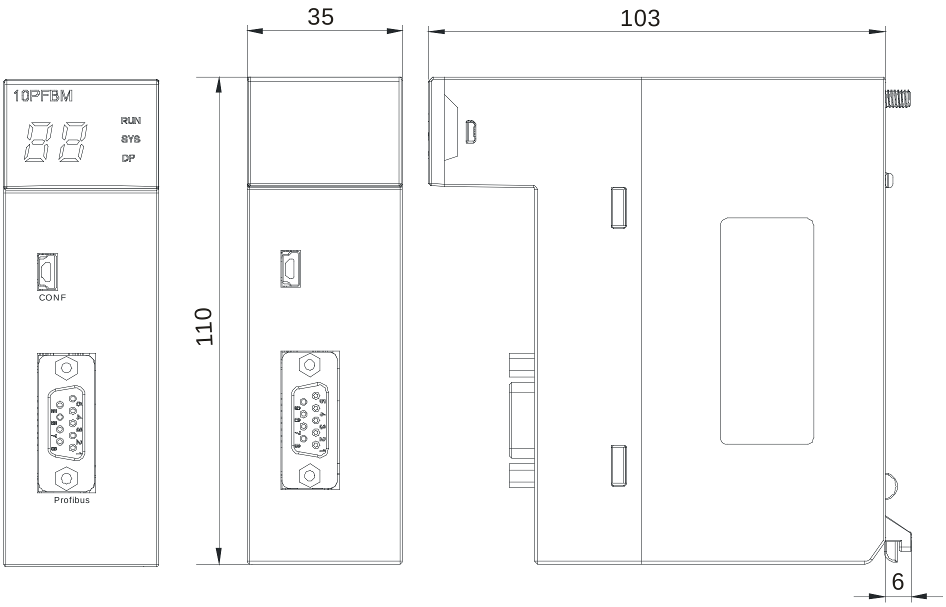
Unit: mm

- **AH10DNET-5A**



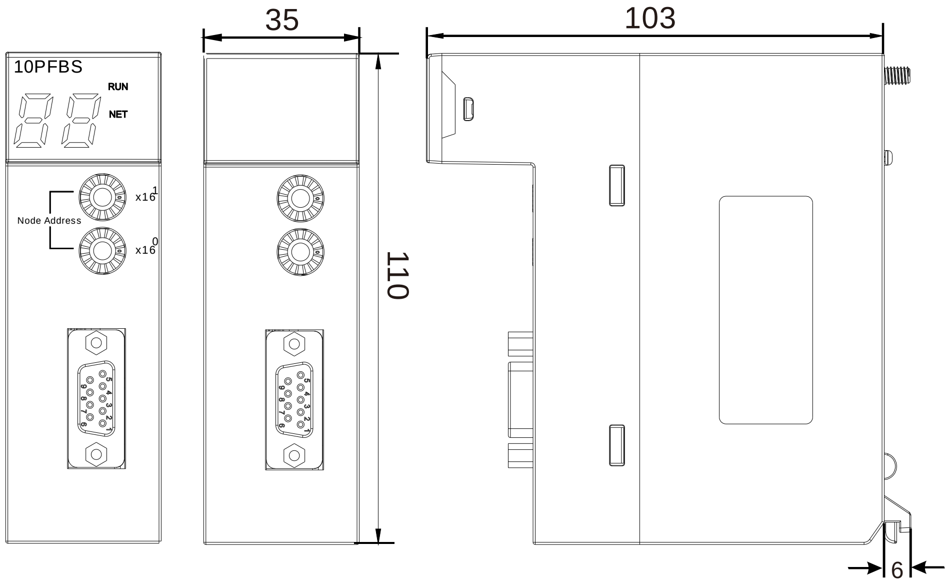
Unit: mm

- **AH10PFBM-5A**



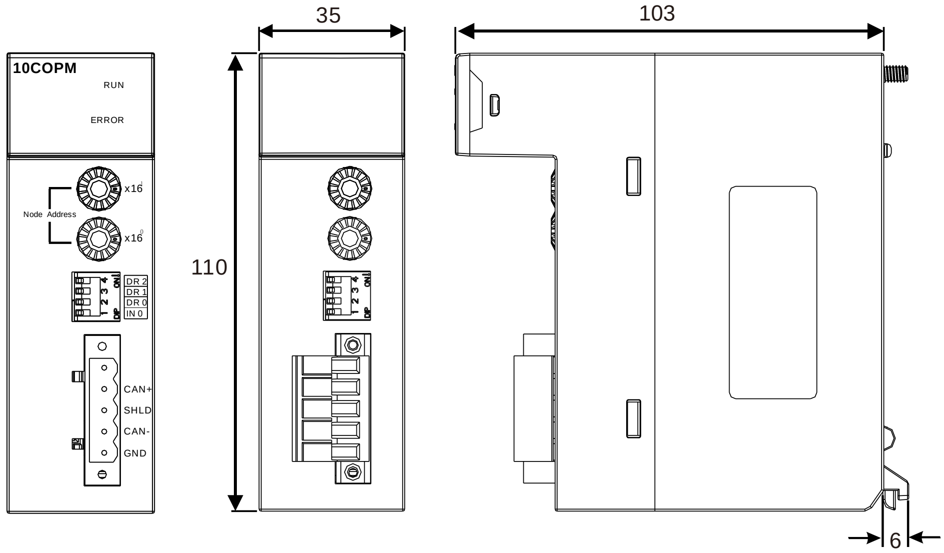
Unit: mm

- **AH10PFBS-5A**



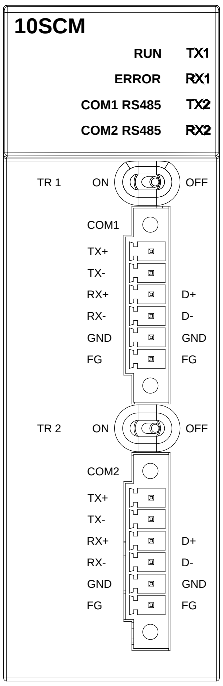
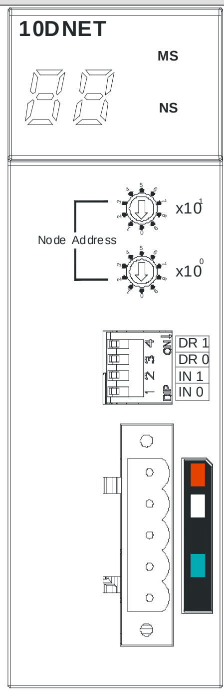
Unit: mm

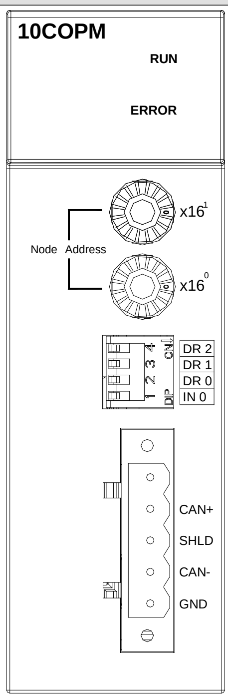
- **AH10COPM-5A**



Unit: mm

2.9.4 Arrangement of Input/Output Terminals

AH10SCM-5A	AH10DNET-5A
	

AH10COPM-5A


2.10 Specifications for Motion Control Modules

2.10.1 General Specifications

- **AH02HC-5A**

Item		Specifications
Number of channels		2 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting down (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs) Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	General count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1-
	Signal level	5~24 VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA
Weight		200g

- **AH04HC-5A**

Item		Specifications
Number of channels		4 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11- CH2: X0.12+, X0.12-, X0.13+, and X0.13- CH3: X0.14+, X0.14-, X0.15+, and X0.15-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting up (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs) Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.

Item		Specifications
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	Linear count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1- CH2: X0.2+ and X0.2- CH3: X0.3+ and X0.3-
	Signal level	5~24VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector. CH2: The high-speed pulse output Y0.10 is a transistor whose collector is an open collector. CH3: The high-speed pulse output Y0.11 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA
Weight		200g

- **AH05PM-5A**

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="3">Specifications</th></tr>
<tr><th colspan="3">AH05PM-5A</th></tr>
<tr><td colspan="2">Number of actual axes</td><td colspan="3">2 axes</td></tr>
<tr><td colspan="2">Storage</td><td colspan="3">The capacity of the built-in storage is 64K steps.</td></tr>
<tr><td colspan="2">Unit</td><td>Motor unit</td><td>Compound unit</td><td>Mechanical unit</td></tr>
<tr><td colspan="2">Connection with a CPU module</td><td colspan="3">Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.</td></tr>
<tr><td colspan="2">Motor control</td><td colspan="3">There are three types of pulse output modes. These modes adopt the differential output.
1. Pulse/Direction
2. Counting up/Counting down
3. A/B-phase output</td></tr>
<tr><td colspan="2">Maximum speed</td><td colspan="3">Single axis: 1M PPS
Multi-axis interpolation: 1M PPS</td></tr>
<tr><td>Input signal</td><td>Detector</td><td colspan="3">X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13</td></tr>
<tr><td>Output signal</td><td>Servo output signal</td><td colspan="3">Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.8, and Y0.9</td></tr>
<tr><td colspan="2">External communication port</td><td colspan="3">Mini USB port</td></tr>
<tr><td colspan="2">Number of basic instructions</td><td colspan="3">27</td></tr>
<tr><td colspan="2">Number of applied instructions</td><td colspan="3">130</td></tr>
</table>

Item	Specifications
	AH05PM-5A
M-code	1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) Users can use them freely.
G-code	G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G90 (absolute programming), and G91 (incremental programming)
Weight	200g

Description of the terminals

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13	1. They are single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: ◆ X0.0 is the PG input for axis 1, and X0.1 is the PG input for axis 2. ◆ X0.12 is the DOG input for axis 1, and X0.13 is the DOG input for axis 2. ◆ X0.8 and X0.9 are for a manual pulse generator. ● High-speed count: ◆ X0.0 is the RESET input for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals: X0.8, X0.9, X0.12, X0.13	100 kHz (*1)	15 mA	24 V
Y0.8 and Y0.9	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: Y0.8 is the CLEAR output for axis 1, and Y0.9 is the CLEAR output for axis 2. ● High-speed comparison and catch: The high-speed comparison output teminals provide the PWM function.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, and Y0.3-	1. They are differential output terminals. 2. The function of the terminals: ● Motion control: ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase output temrinals for axis 2. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH10PM-5A**

Item		Specifications		
		AH10PM-5A		
Number of actual axes		6 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.8, X0.9, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-		
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, and Y0.11		
External communication port		Mini USB port Ethernet port		
Expansion storage device		Mini SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) Users can use them freely.		
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)		
Weight		220g		

Description of the terminals

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. They are differential input temrinalss. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input temrinals for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches.	200 kHz	15 mA	5~24 V
X0.8 and X0.9	1. They are single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	100 kHz (*1)	15 mA	24 V
X0.10, X0.11, X0.12, X0.13, X0.14, and X0.15	1 They are single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 6. ● High-speed counter: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1, X0.12 is the A-phase input for counter 2 and counter 4, and X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11 is the B-phase input for counter 1, X0.13 is the B-phase input for counter 2 and counter 4, and X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	100 kHz (*1)	15 mA	24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: ◆ The terminals are the CLEAR output terminals for axis 1~axis 4, and provide the PWM function.	200 kHz	15 mA	24 V

Terminal	Description	Response characteristic	Maximum input Current	Maximum input Voltage
	◆ Y0.8 and Y0.9 are for axis 5. Y0.10 and Y0.11 are for axis 6. Y0.8 is the A-phase output for axis 5, and Y0.10 is the A-phase output for axis 6. Y0.9 is the B-phase output for axis 5, and Y0.11 is the B-phase output for axis 6. ● High-speed comparison and catch: The terminals can function as high-speed comparison output terminals.			
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. They are differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output terminals for axis 6.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

● **AH15PM-5A**

Item		AH15PM-5A		
Number of actual axes		4 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-, X0.4, X0.5, X0.6, X0.7, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, X1.1, X1.2, X1.3, X1.4, X1.5		
Output signal	**Servo output signal**	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, and Y0.11		

Item	AH15PM-5A
External communication port	Mini USB port Ethernet port
Expansion storage device	Mini SD card The maximum capacity is 32 GB.
Number of basic instructions	27
Number of applied instructions	130
M-code	1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) Users can use them freely.
G-code	G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)
Weight	220g

Description of the terminals

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input terminals for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V
X0.4, X0.5, X0.6, and X0.7	1 They are single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 4.	100 kHz (*1)	15 mA	24 V
X0.8+, X0.8-, X0.9+, and X0.9-	1. They are differential input temrinals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0, and X0.9+ and X0.9- are the B-phase input terminals for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches.	200 kHz	15 mA	5~24 V

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
	● Interrupt input terminals			
X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, and X1.1	1 They are differential input temrinals. 2 The functions of the terminals: ● Motion control: X0.10 is LSP0, X0.11 is LSN0, X0.12 is LSP1, X0.13 is LSN1, X0.14 is LSP2, X0.15 is LSN2, X1.0 is LSP3, and X1.1 is LSN3. ● High-speed count: ◆ The terminals are for counter 1~ 5. ◆ X0.10 is the A-phase input for counter 1. X0.12 is the A-phase input for counter 2 and counter 4. X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11is the B-phase input for counter 1. X0.13 is the B-phase input for counter 2 and counter 4. X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals: X0.10~X0.15	100 kHz (*1)	15 mA	24 V
X1.2, X1.3, X1.4, and X1.5	1. They are single/A/B-phase input terminals.	100 kHz (*1)	15 mA	24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collector. 2. The function of the terminals: ● Motion control: The terminals are the CLEAR output terminals for axis 1~axis 4. ● High-speed comparison and catch: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. They are differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase the output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4.	1 MHz	5 mA	5 V

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
	◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output temrinals for axis 6.			

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH20MC-5A**

Item		Specifications		
		AH20MC-5A		
Number of actual axes		12 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		Delta high-speed motion control system DMCNET (Delta Motion Control Network) The response time is one millisecond.		
Maximum speed		Single axis: 1M PPS Two-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13-, X0.14+, X0.14-, X0.15+, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, X0.3-, X0.8+, X0.8-, X0.9+, X0.9-		
Output signal	**Servo output signal**	Y0.8, Y0.9, Y0.10, Y0.11		
External communication port		Mini USB port Ethernet port DMCNET port		
Expansion storage device		Mini SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		● OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) ● M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) Users can use them freely.		
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)		
Weight		220g		

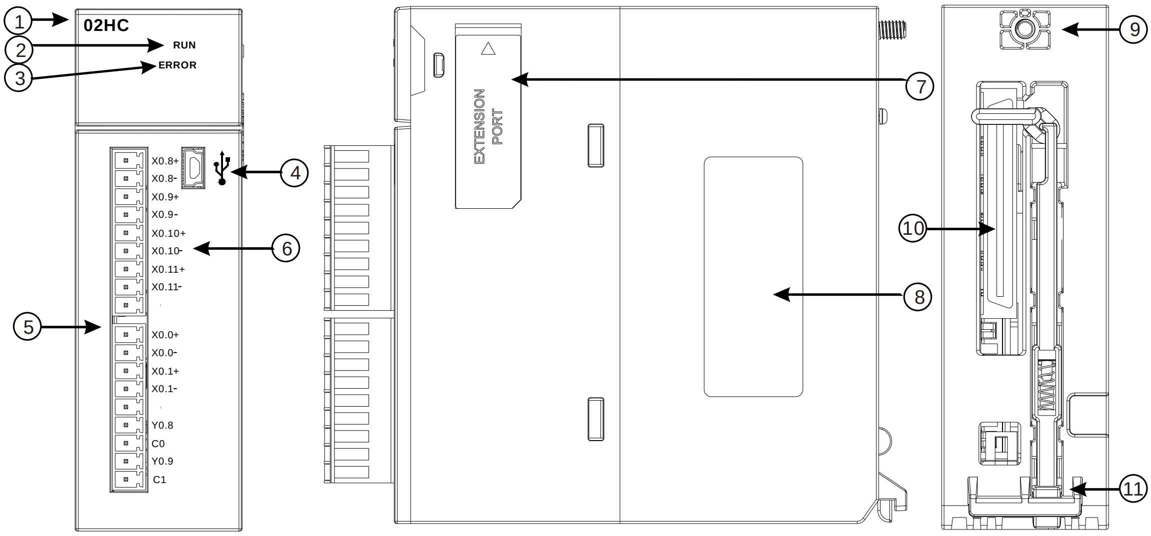
Description of the terminals

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-,	1. They are differential input terminals. 2. The functions of the terminals: ● High-speed count:	200 kHz	15 mA	5~24 V

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.3+, and X0.3-	◆ The terminals are the RESET input terminals for counter 0~counter 5. ◆ X0.0+ and X0.0- are for counter 0. X0.1+ and X0.1- are for counter 1. X0.2+ and X0.2- are for counter 2 and counter 4. X0.3+ and X0.3- are for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches.			
X0.8+, X0.8-, X0.9+, and X0.9-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0. X0.9+ and X0.9- are the B-phase input terminals for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V
X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13, X0.14+, X0.14-, X0.15+, and X0.15-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion Control: Axis 1~6 Dog point pulse input, applicable for single-axis input motion controls. ● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ X0.10+ and X0.10- are the A-phase input terminals for counter 1. X0.12+ and X0.12- are the A-phase input temrinals for counter 2 and counter 4. X0.14+ and X0.14- are the A-phase input terminals for counter 3 and counter 5. ◆ X0.11+ and X0.11- are the B-phase input terminals for counter 1. X0.13+ and X0.13- are the B-phase input terminals for counter 2 and counter 4. X0.15+ and X0.15- are the B-phase input terminals for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output temrinals are transistors whose collectors are open collectors. 2. The function of the terminals: ● High-speed comparison and catch: The terminals can function as high-speed comparison output temrinals.	200 kHz	15 mA	24 V

2.10.2 Profiles

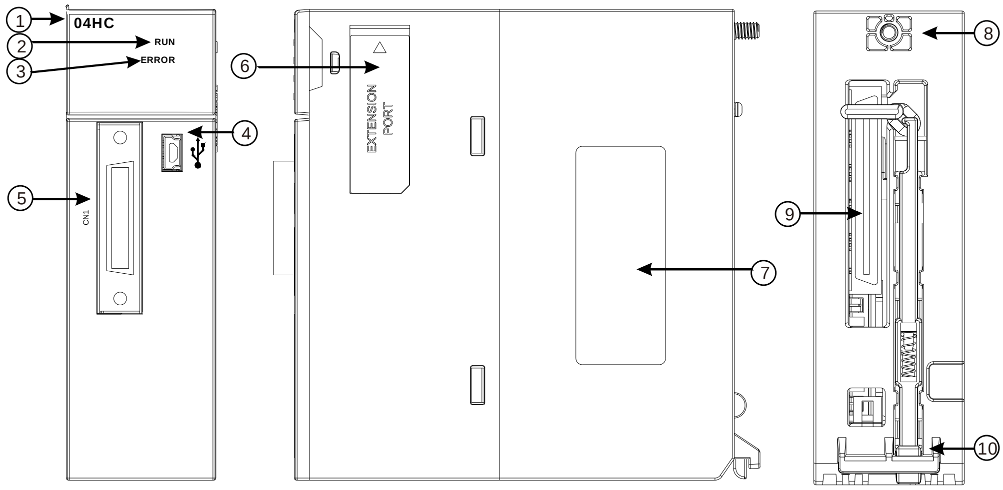
- **AH02HC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	USB port	Providing the mini USB communication interface
5	Terminals	Input/Output terminals
6	Arrangement of the input/output terminals	Arrangement of the terminals
7	Extension port	Updating the firmware
8	Label	Nameplate
9	Set screw	Fixing the module
10	Connector	Connecting the module and a backplane
11	Projection	Fixing the module

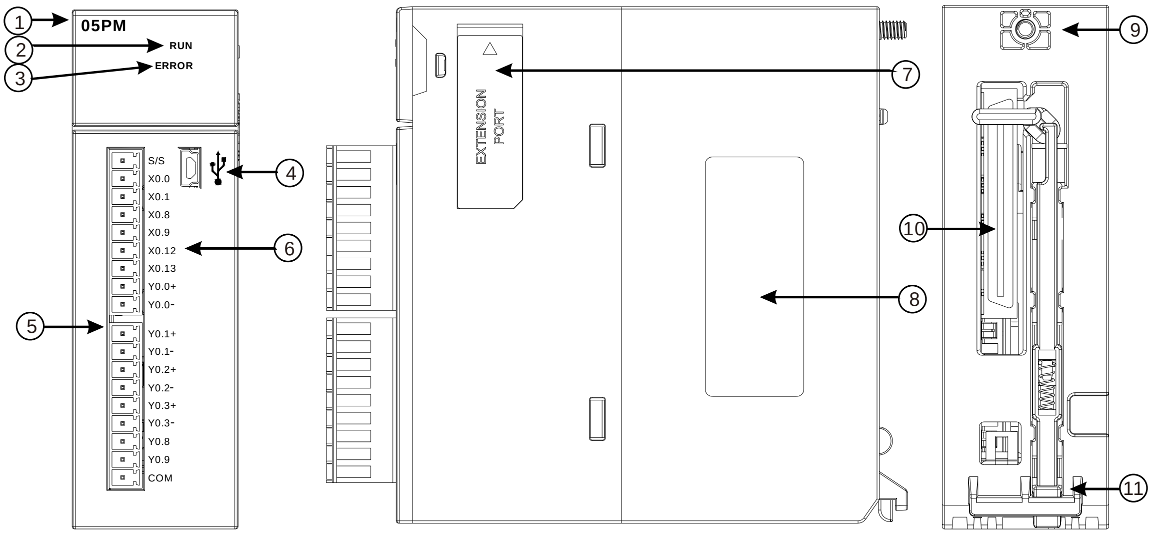
2

- **AH04HC-5A**



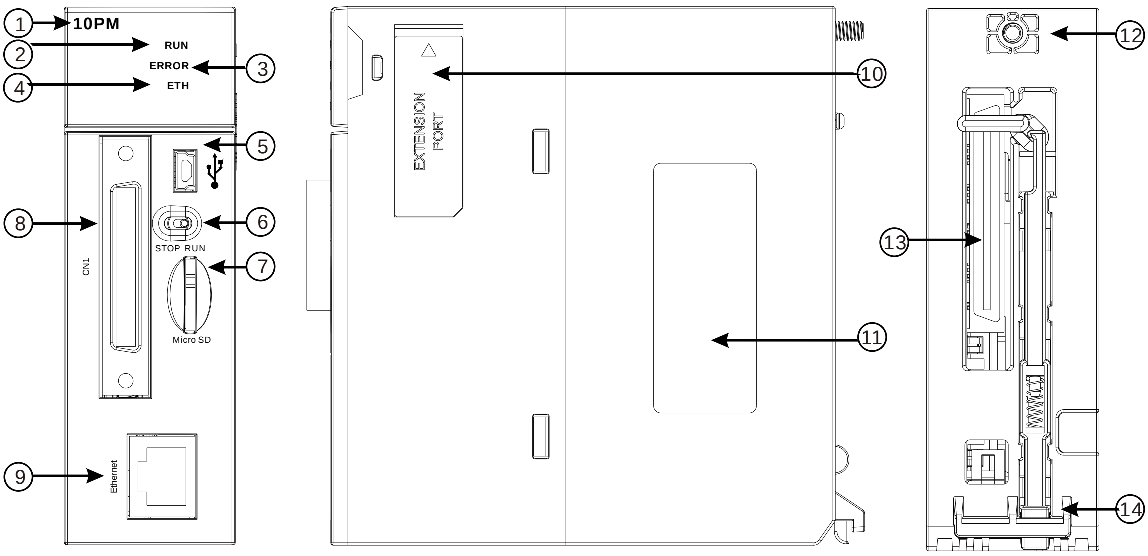
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	USB port	Providing the mini USB communication interface
5	Connector	Connecting the module and an I/O extension cable
6	Extension port	Updating the firmware
7	Label	Nameplate
8	Set screw	Fixing the module
9	Connector	Connecting the module and a backplane
10	Projection	Fixing the module

- **AH05PM-5A**



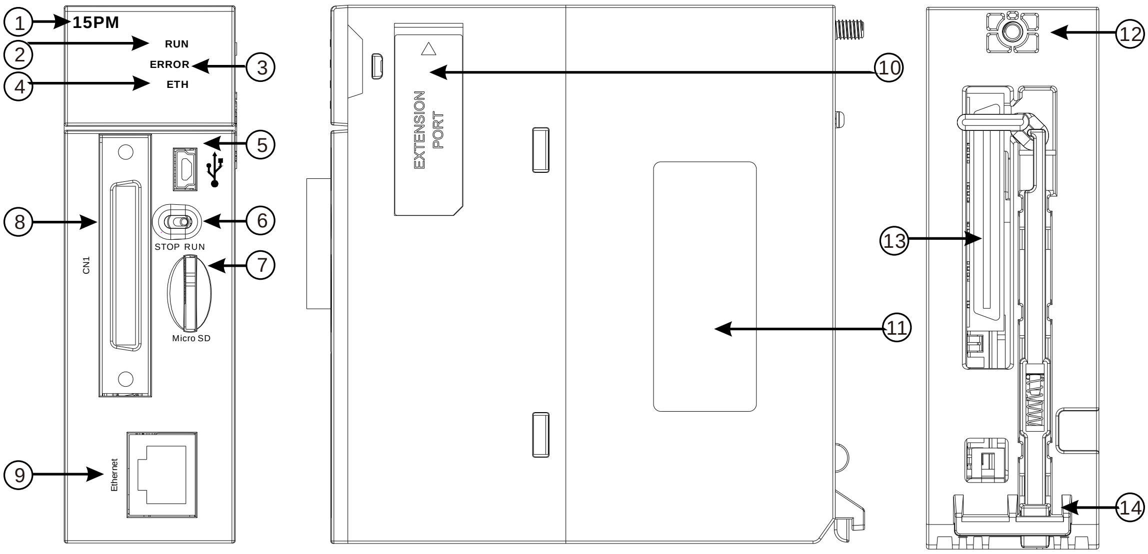
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	USB port	Providing the mini USB communication interface
5	Terminals	Input/Output terminals
6	Arrangement of the input/output terminals	Arrangement of the terminals
7	Extension port	Updating the firmware
8	Label	Nameplate
9	Set screw	Fixing the module
10	Connector	Connecting the module and a backplane
11	Projection	Fixing the module

- **AH10PM-5A**



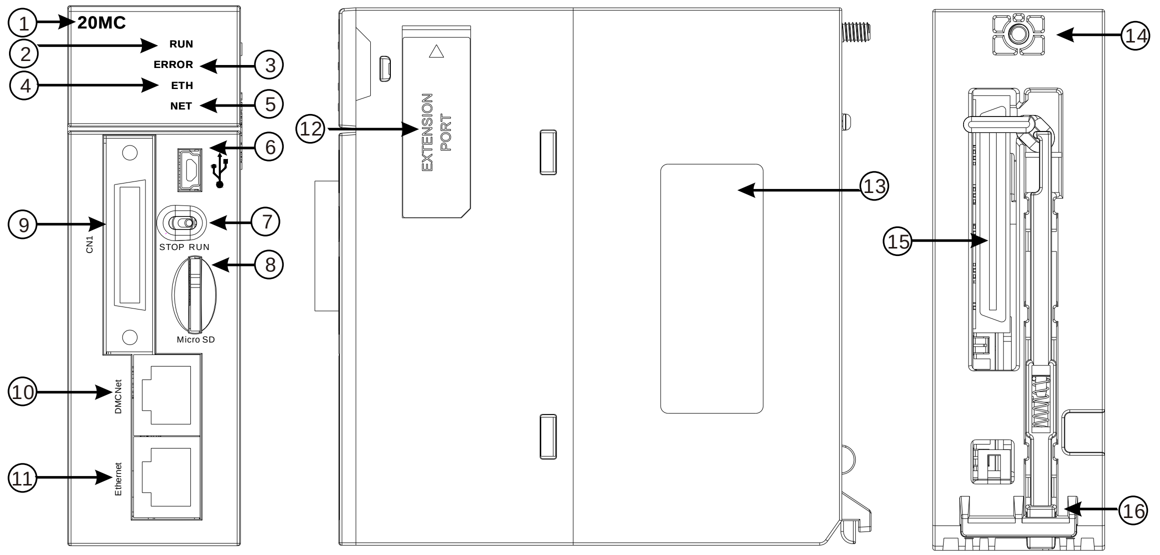
Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	Ethernet connection LED indicator (green)	Status of the Ethernet connection ON: The Ethernet connection is being connected. OFF: The Ethernet connection is disconnected.
5	USB port	Providing the mini USB communication interface
6	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.
7	SD slot	Providing the SD interface
8	Connector	Connecting the module and an I/O extension cable
9	Ethernet port	Providing the Ethernet communication interface
10	Extension port	Updating the firmware
11	Label	Nameplate
12	Set screw	Fixing the module
13	Connector	Connecting the module and a backplane
14	Projection	Fixing the module

- **AH15PM-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	Ethernet connection LED indicator (green)	Status of the Ethernet connection ON: The Ethernet connection is being connected. OFF: The Ethernet connection is disconnected.
5	USB port	Providing the mini USB communication interface
6	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.
7	SD slot	Providing the SD interface
8	Connector	Connecting the module and an I/O extension cable
9	Ethernet port	Providing the Ethernet communication interface
10	Extension port	Updating the firmware
11	Label	Nameplate
12	Set screw	Fixing the module
13	Connector	Connecting the module and a backplane
14	Projection	Fixing the module

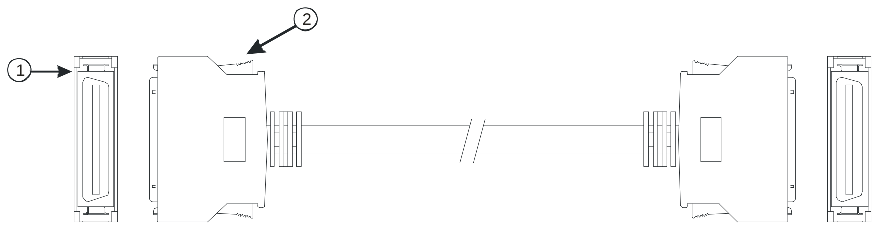
- **AH20MC-5A**



Number	Name	Description
1	Model name	Model name of the module
2	RUN LED indicator (green)	Operating status of the module ON: The module is running. OFF: The module stops running.
3	ERROR LED indicator (red)	Error status of the module Blinking: The module is abnormal.
4	Ethernet connection LED indicator (green)	Status of the Ethernet connection ON: The Ethernet connection is being connected. OFF: The Ethernet connection is disconnected.
5	DMCNET connection LED indicator (green)	Status of the DMCNET connection ON: The DMCNET connection is being connected. OFF: The DMCNET connection is disconnected.
6	USB port	Providing the mini USB communication interface
7	RUN/STOP switch	RUN: The user program is executed. STOP: The execution of the user program stops.
8	SD slot	Providing the SD interface
9	Connector	Connecting the module and an I/O extension cable.
10	DMCNET port	Providing the DMCNET communication interface
11	Ethernet port	Providing the Ethernet communication interface
12	Extension port	For updating the firmware
13	Label	Nameplate
14	Set screw	Fixing the module
15	Connector	Connecting the module and a backplane
16	Projection	Fixing the module

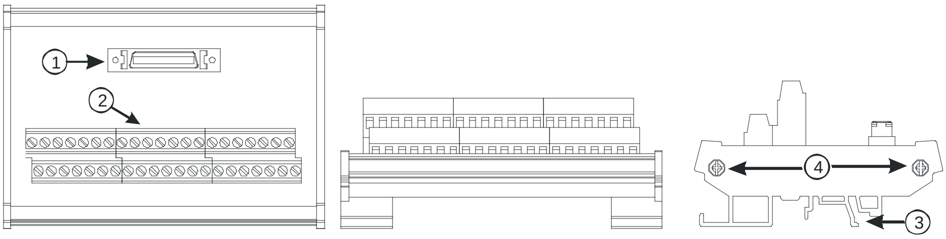
- **I/O extension cable, and external terminal module**

1. I/O extension cable UC-ET010-13B/UC-ET010-15B

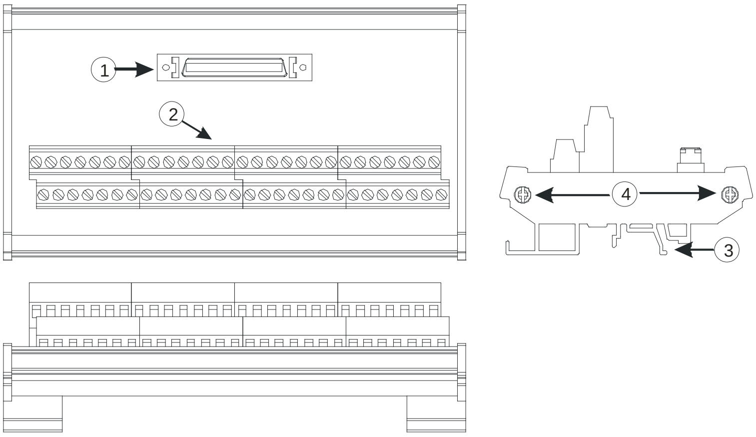


Number	Name	Description
1	Connector	Connecting a motion control module and an external terminal module UC-ET010-13Bis a 36-pin I/O extension cable for AH04HC-5A and AH20MC-5A. UC-ET010-15B is a 50-pin I/O extension cable for AH10PM-5A and AH15PM-5A.
2	Clip	Fixing the connector

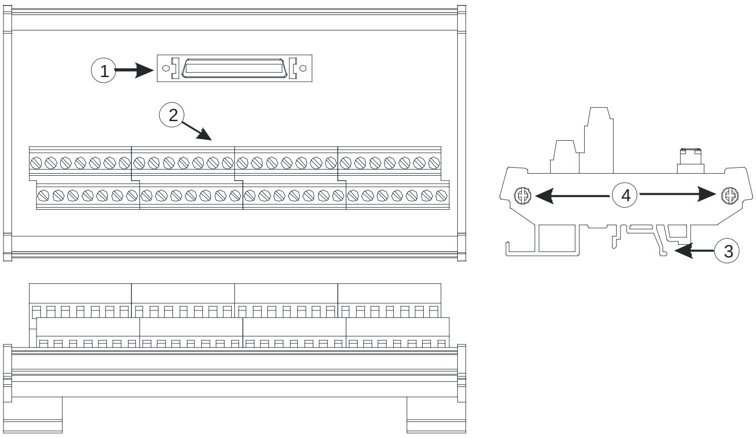
2. External terminal module for AH04HC-5A and AH20MC-5A: UB-10-IO16C



3. External terminal module for AH10PM-5A: UB-10-IO24CC



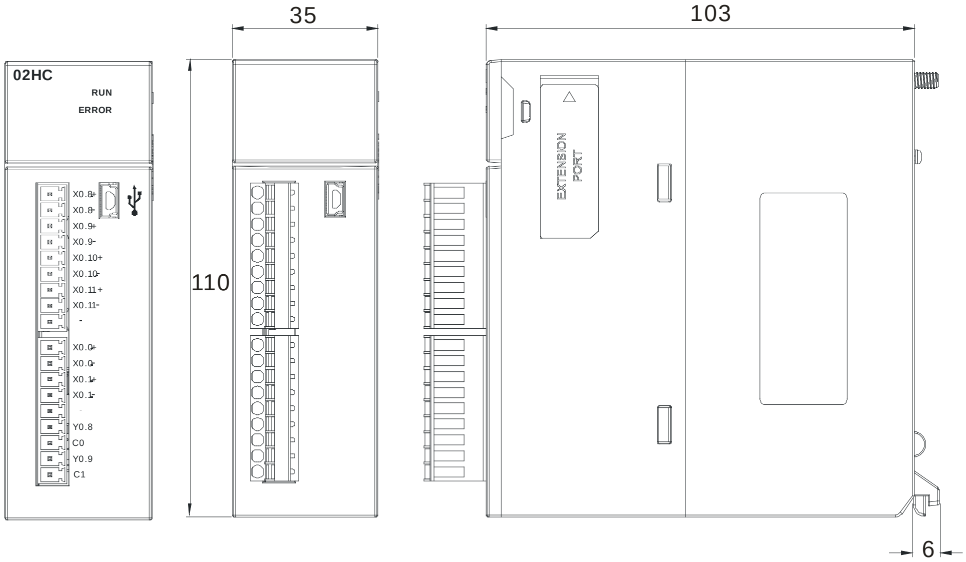
4. External terminal module for AH15PM-5A: UB-10-IO34CC



Number	Name	Description
1	Connector	Connecting the external terminal module and a motion control module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

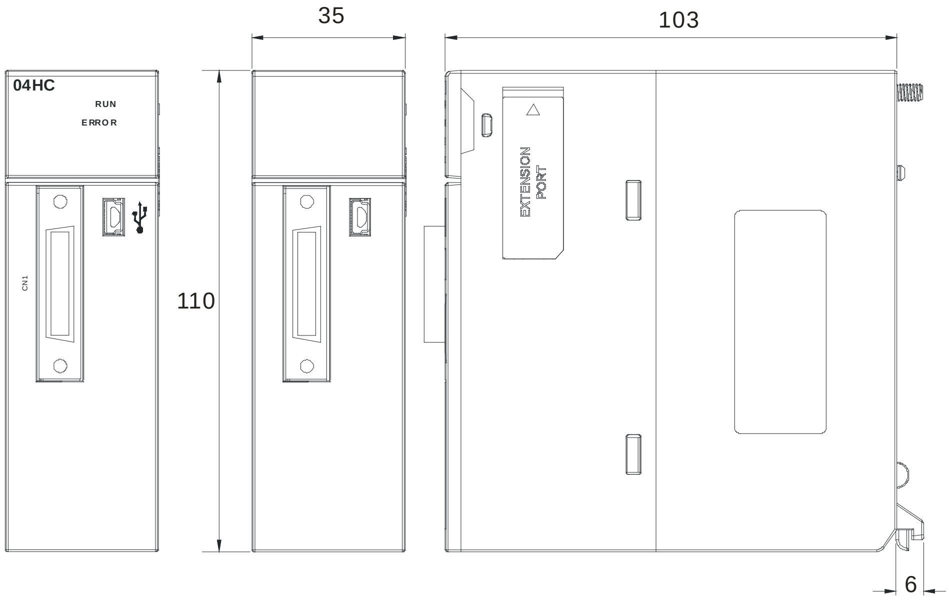
2.10.3 Dimensions

- **AH02HC-5A**



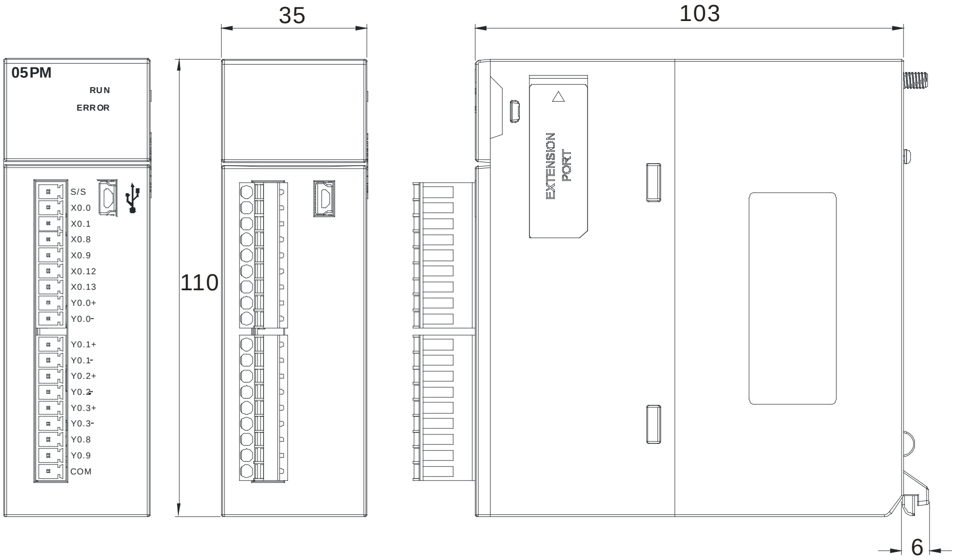
Unit: mm

- **AH04HC-5A**



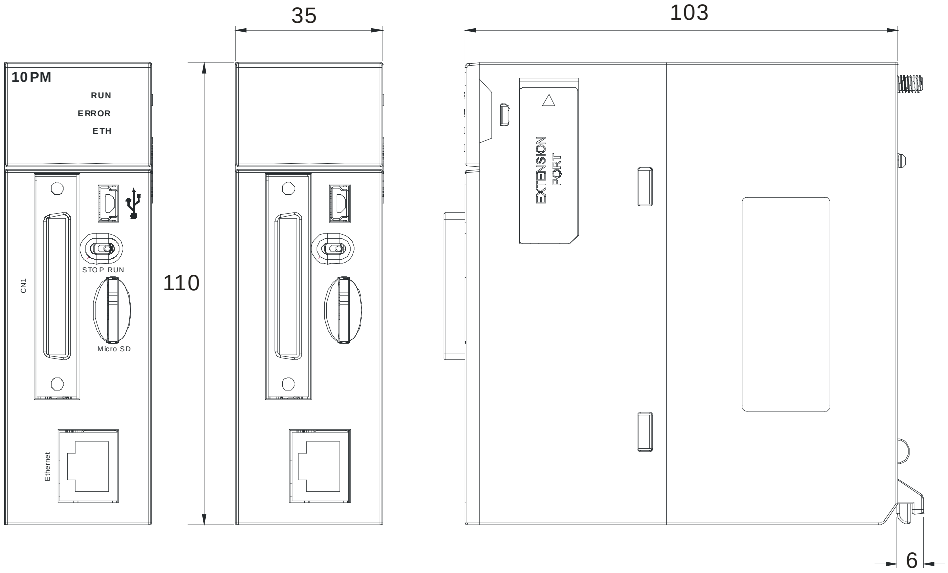
Unit: mm

- **AH05PM-5A**



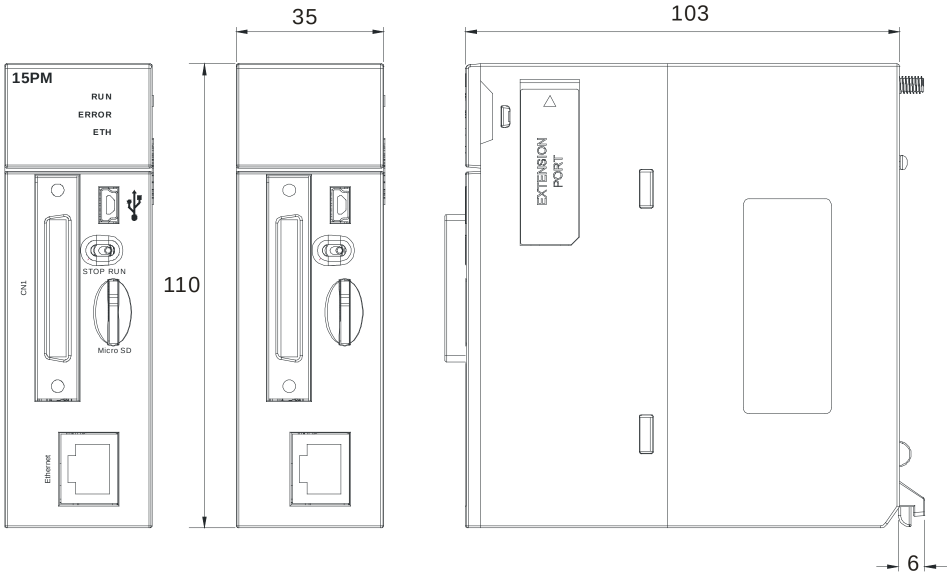
Unit: mm

- **AH10PM-5A**



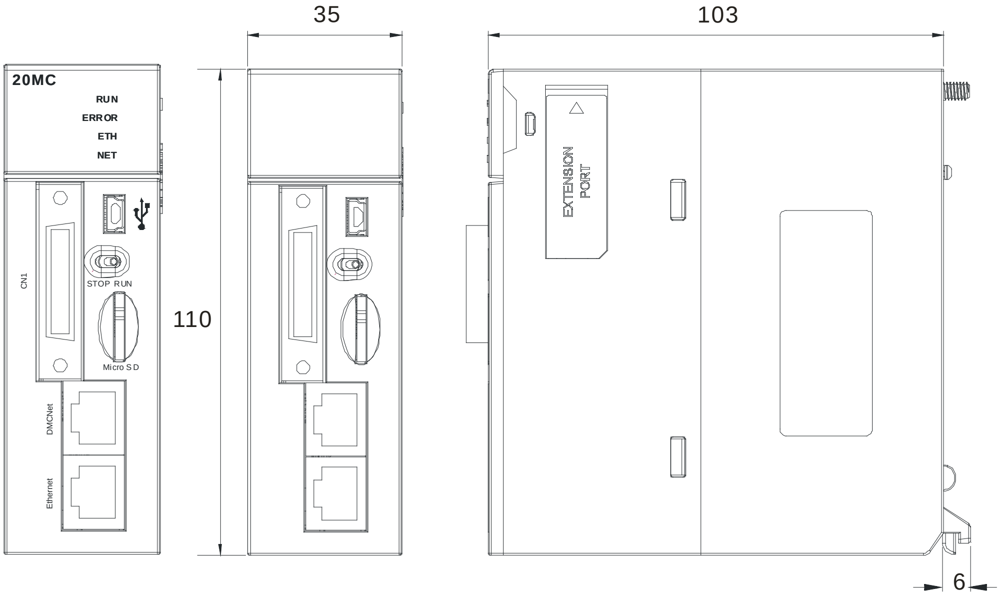
Unit: mm

- **AH15PM-5A**



Unit: mm

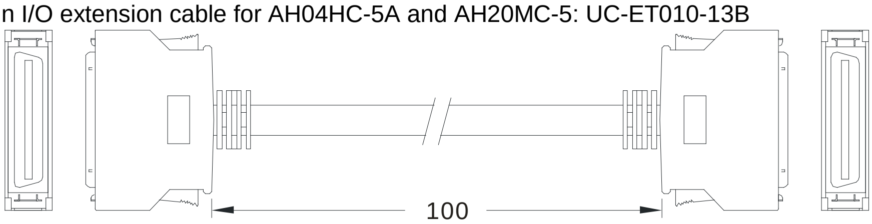
- **AH20MC-5A**



Unit: mm

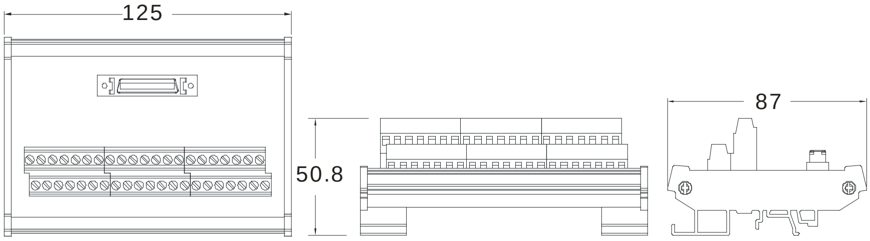
- **I/O extension cable, and external terminal module**

1. 36-pin I/O extension cable for AH04HC-5A and AH20MC-5: UC-ET010-13B



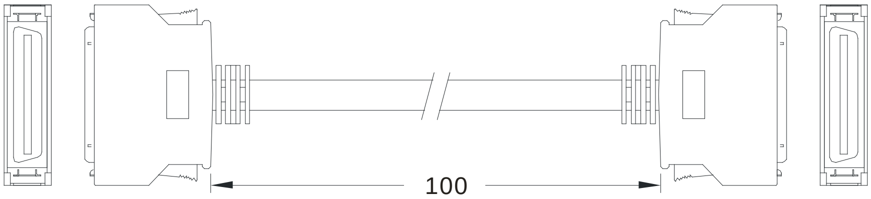
Unit: cm

2. External terminal module for AH04HC-5A and AH20MC-5A: UB-10-IO16C



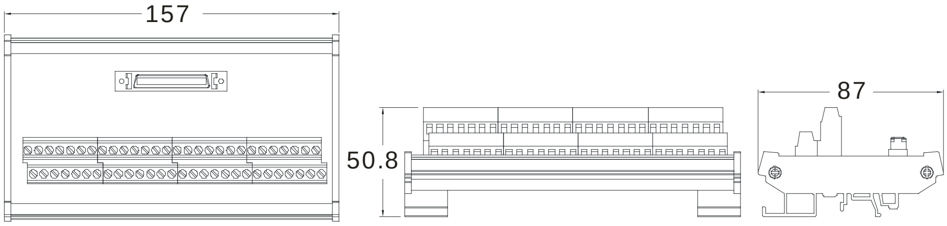
Unit: mm

3. 50-pin I/O extension cable for AH10PM-5A and AH15PM-5A: UC-ET010-15B



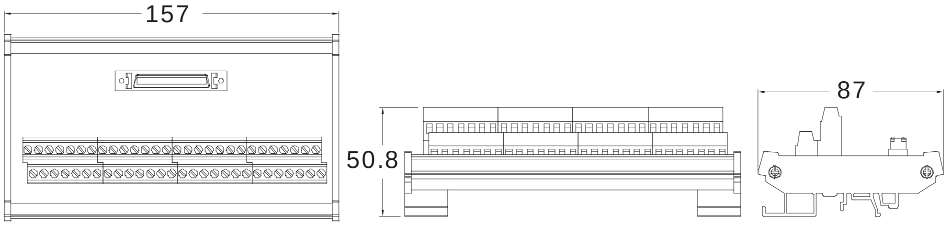
Unit: cm

4. External terminal module for AH10PM-5A: UB-10-IO24CC



Unit: mm

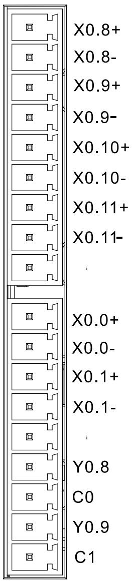
5. External terminal module for AH15PM-5A: UB-10-IO34CC



Unit: mm

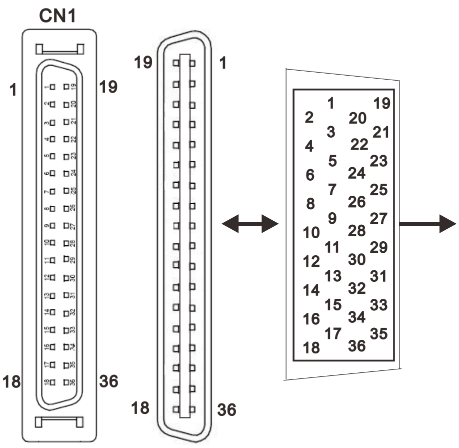
2.10.4 Arrangement of Input/Output Terminals

- **AH02HC-5A**



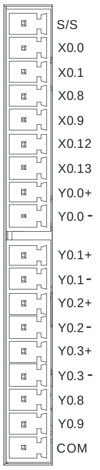
Terminal	Function	Terminal	Function
	Count		Count
X0.8+	CntA0+	X0.0+	Rst0+
X0.8-	CntA0-	X0.0-	Rst0-
X0.9+	CntB0+	X0.1+	Rst1+
X0.9-	CntB0-	X0.1-	Rst1-
X0.10+	CntA1+	Y0.8	Out0
X0.10-	CntA1-	C0	COM0
X0.11+	CntB1+	Y0.9	Out1
X0.11-	CntB1-	C1	COM1

- **AH04HC-5A**



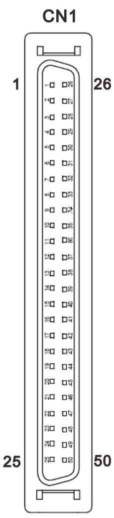
Pin	Terminal	Function	Pin	Terminal	Function
		Count			Count
1	C3	COM3	2	Y0.11	Out3
3	C2	COM2	4	Y0.10	Out2
5	C1	COM1	6	Y0.9	Out1
7	C0	COM0	8	Y0.8	Out0
9	-	-	10	-	-
11	-	-	12	-	-
13	X0.3-	Rst3-	14	X0.3+	Rst3+
15	X0.15-	CntB3-	16	X0.15+	CntB3+
17	X0.14-	CntA3-	18	X0.14+	CntA3+
19	X0.2-	Rst2-	20	X0.2+	Rst2+
21	X0.13-	CntB2-	22	X0.13+	CntB2+
23	X0.12-	CntA2-	24	X0.12+	CntA2+
25	X0.1-	Rst1-	26	X0.1+	Rst1+
27	X0.11-	CntB1-	28	X0.11+	CntB1+
29	X0.10-	CntA1-	30	X0.10+	CntA1+
31	X0.0-	Rst0-	32	X0.0+	Rst0+
33	X0.9-	CntB0-	34	X0.9+	CntB0+
35	X0.8-	CntA0-	36	X0.8+	CntA0+

- **AH05PM-5A**



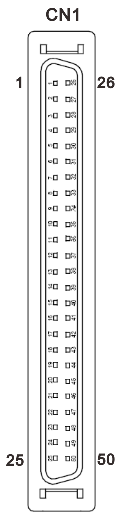
Terminal	Function		Terminal	Function	
	Pulse	Count		Pulse	Count
S/S	S/S	S/S	Y0.1+	B0+	-
X0.0	PG0	Rst0	Y0.1-	B0-	-
X0.1	PG1	-	Y0.2+	A1+	-
X0.8	MPGA	CntA0	Y0.2-	A1-	-
X0.9	MPGB	CntB0	Y0.3+	B1+	-
X0.12	DOG0	-	Y0.3-	B1-	-
X0.13	DOG1	-	Y0.8	CLR0	-
Y0.0+	A0+	-	Y0.9	CLR1	-
Y0.0-	A0-	-	COM	-	-

- **AH10PM-5A**



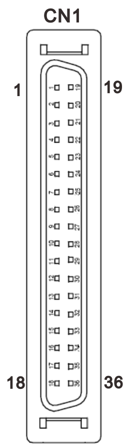
Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	COM3	-	26	Y0.11	CLR3/B5	-
2	C2	COM2	-	27	Y0.10	CLR2/A5	-
3	C1	COM1	-	28	Y0.9	CLR1/B4	-
4	C0	COM0	-	29	Y0.8	CLR0/A4	-
5	NC	-	. -	30	NC	-	-
6	Y0.7-	B3-	-	31	Y0.7+	B3+	-
7	Y0.6-	A3-	-	32	Y0.6+	A3+	-
8	Y0.5-	B2-	-	33	Y0.5+	B2+	-
9	Y0.4-	A2-	-	34	Y0.4+	A2+	-
10	Y0.3-	B1-	-	35	Y0.3+	B1+	-
11	Y0.2-	A1-	-	36	Y0.2+	A1+	-
12	Y0.1-	B0-/CLR5-	-	37	Y0.1+	B0+/CLR5+	-
13	Y0.0-	A0-/CLR4-	-	38	Y0.0+	A0+/CLR4+	-
14	NC	-	-	39	NC	-	-
15	NC	-	-	40	S/S	S/S	S/S
16	X0.15	DOG3	CntB3/CntB5	41	X0.14	DOG2	CntB3/CntA5
17	X0.13	DOG1	CntB2/CntB4	42	X0.12	DOG0	CntA2/CntA4
18	X0.11	DOG5	CntB1	43	X0.10	DOG4	CntA1
19	X0.9	MPGB	CntB0	44	X0.8	MPGA	CntA0
20	NC	-	-	45	NC	-	-
21	NC	-	-	46	NC	-	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

- **AH15PM-5A**



Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	Y0.11	CLR3	-	26	Y0.10	CLR2	-
2	Y0.9	CLR1	-	27	Y0.8	CLR0	
3	COM	COM	-	28	Y0.7+	B3+	-
4	Y0.7-	B3-	-	29	Y0.6+	A3+	-
5	Y0.6-	A3-	. -	30	Y0.5+	B2+	-
6	Y0.5-	B2-	-	31	Y0.4+	A2+	-
7	Y0.4-	A2-	-	32	Y0.3+	B1+	-
8	Y0.3-	B1-	-	33	Y0.2+	A1+	-
9	Y0.2-	A1-	-	34	Y0.1+	B0+	-
10	Y0.1-	B0-	-	35	Y0.0+	A0+	-
11	Y0.0-	A0-	-	36	S/S	S/S	S/S
12	X1.5	CHG3	-	37	X1.4	CHG2	-
13	X1.3	CHG1	-	38	X1.2	CHG0	-
14	X1.1	LSN3	-	39	X1.0	LSP3	-
15	X0.15	LSN2	CntB3/CntB5	40	X0.14	LSP2	CntB3/CntA5
16	X0.13	LSN1	CntB2/CntB4	41	X0.12	LSP1	CntA2/CntA4
17	X0.11	LSN0	CntB1	42	X0.10	LSP0	CntA1
18	X0.9-	MPGB-	CntB0-	43	X0.9+	MPGB+	CntB0+
19	X0.8-	MPGA-	CntA0-	44	X0.8+	MPGA+	CntA0+
20	X0.7	DOG3	-	45	X0.6	DOG2	-
21	X0.5	DOG1	-	46	X0.4	DOG0	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/ Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

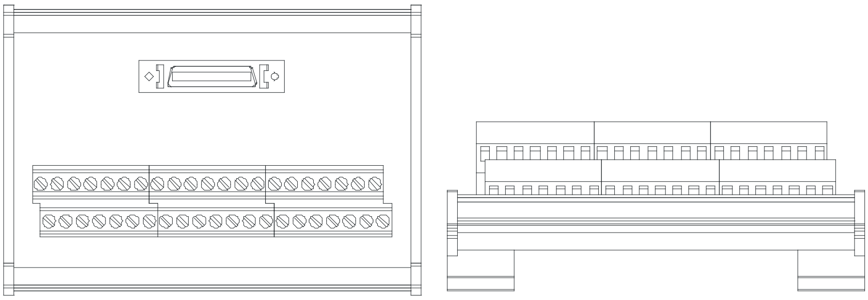
- **AH20MC-5A**



Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	-	COM3	19	Y0.11	-	Out3
2	C2	-	COM2	20	Y0.10	-	Out2
3	C1	-	COM1	21	Y0.9	-	Out1
4	C0	-	COM0	22	Y0.8	-	Out0
5	NC	-	-	23	NC	-	-
6	NC	-	-	24	NC	-	-
7	X0.3-	-	Rst3-/Rst5-	25	X0.3+	-	Rst3+/Rst5+
8	X0.15-	DOG3-	CntB3-/ CntB5+	26	X0.15+	DOG3+	CntB3+/CntB5+
9	X0.14-	DOG2-	CntA3-/ CntA5+	27	X0.14+	DOG2+	CntA3+/CntA5+
10	X0.2-	-	Rst2-/Rst4-	28	X0.2+	-	Rst2+/Rst4+
11	X0.13-	DOG1-	CntB2-/ CntB4-	29	X0.13+	DOG1+	CntB2+/CntB4+
12	X0.12-	DOG0-	CntA2-/ CntA4-	30	X0.12+	DOG0+	CntA2+/CntA4+
13	X0.1-	-	Rst1-	31	X0.1+	-	Rst1+
14	X0.11-	DOG5-	CntB1-	32	X0.11+	DOG5+	CntB1+
15	X0.10-	DOG4-	CntA1-	33	X0.10+	DOG4+	CntA1+
16	X0.0-	-	Rst0-	34	X0.0+	-	Rst0+
17	X0.9-	MPGB-	CntB0-	35	X0.9+	MPGB+	CntB0+
18	X0.8-	MPGA-	CntA0-	36	X0.8+	MPGA+	CntA0+

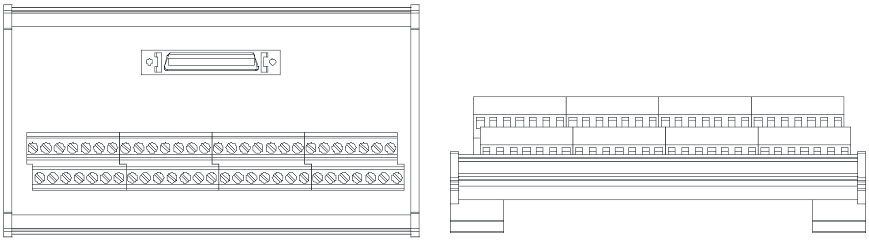
- **External terminal module**

1. External terminal module for AH04HC-5A: UB-10-IO16C



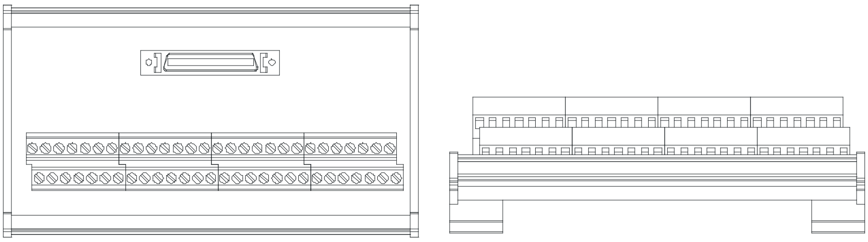
C3	C2	C1	C0	N/C	N/C	X0.3-	X0.15-	X0.14-	X0.2-	X0.13-	X0.12-	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	N/C	N/C	X0.3+	X0.15+	X0.14+	X0.2+	X0.13+	X0.12+	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

2. External terminal module for AH10PM-5A: UB-10-IO24CC



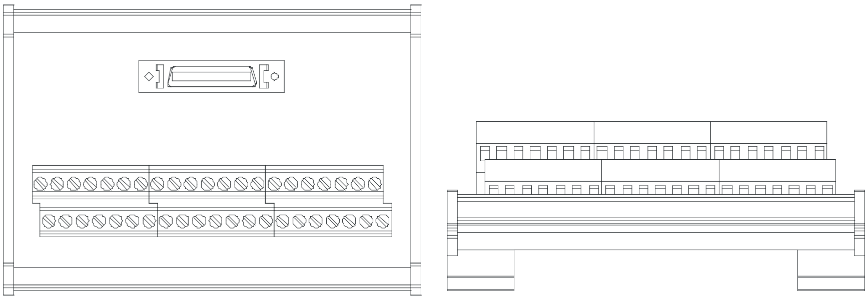
1st from the upper left	C3	C2	C1	C0	N/C	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	N/C
15th from the upper left	N/C	X0.15	X0.13	X0.11	X0.9	N/C	N/C	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.11	Y0.10	Y0.9	Y0.8	N/C	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	N/C
15th from the lower left	S/S	X0.14	X0.12	X0.10	X0.8	N/C	N/C	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

3. External terminal module for AH15PM-5A: UB-10-IO34CC



1st from the upper left	Y0.11	Y0.9	COM	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	X1.5	X1.3	X1.1
15th from the upper left	X0.15	X0.13	X0.11	X0.9-	X0.8-	X0.7	X0.5	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.10	Y0.8	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	S/S	X1.4	X1.2	X1.0
15th from the lower left	X0.14	X0.12	X0.10	X0.9+	X0.8+	X0.6	X0.4	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

4. External terminal module for AH20MC-5A: UB-10-IO16C



C3	C2	C1	C0	N/C	N/C	X0.3-	X0.15-	X0.14-	X0.2-	X0.13-	X0.12-	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	N/C	N/C	X0.3+	X0.15+	X0.14+	X0.2+	X0.13+	X0.12+	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

2.11 Specifications for the Remote I/O Modules

2.11.1 General Specifications

- **AHRTU-DNET-5A**

Item	Specifications
Communication type	CAN
Connector type	Removable connector (5.08 mm)
Data type	I/O polled, and explicit
Communication speed	Standard mode: 125 kbps, 250 kbps, and 500 kbps Extended mode: 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, and 1 Mbps
Communication cable	Delta shielded twisted pair cables (Two communication cables, two power cables, and one shielded cable)
Electronical isolation	500 VAC
Weight	150g

- **AHRTU-PFBS-5A**

Item	Specifications
Communication type	High-speed RS-485
Connector type	DB9 connector
Data type	Cyclic data exchange
Communication speed	9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps, 3 Mbps, 6 Mbps, and 12 Mbps are supported.
Communication cable	Shielded twisted pair cable
Electronical isolation	500 VAC
Weight	200g

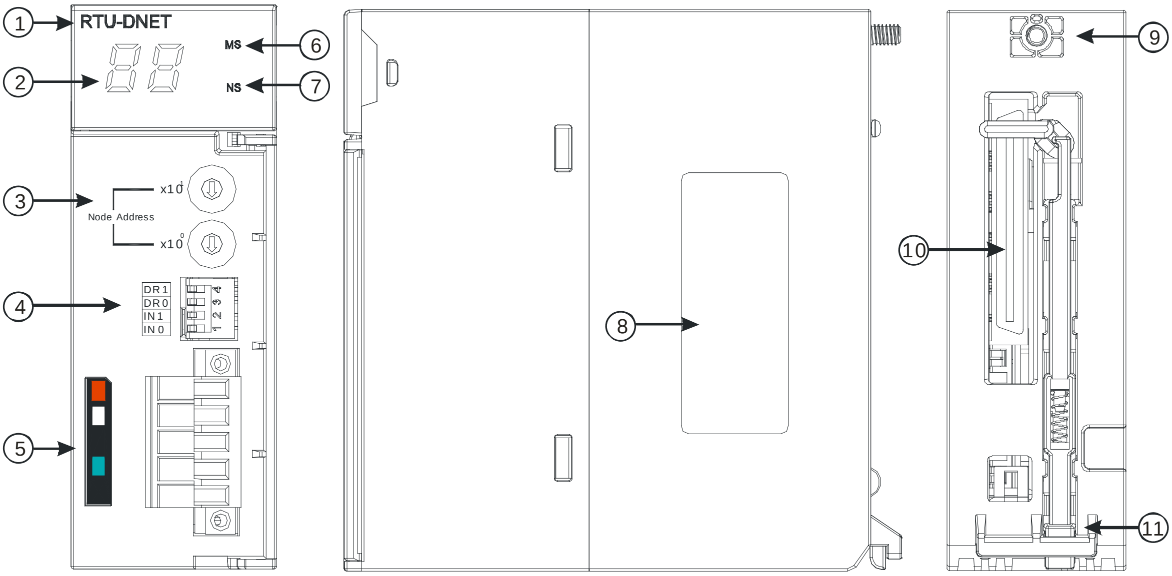
- **AHRTU-ETHN-5A**

Item	Specifications
Communication type	EtherNet/IP, MODBUS TCP
Protocol	BOOTP, DHCP, NTP
Communication speed	10/100 Mbps Auto-Detection
Communication Interface	RJ-45 with Auto MDI/MDIX
Numbers of the Ethernet Communication Port	2 (X1, X2)
Electronical isolation	1500 VAC
Weight	177g

2.11.2 Profiles

- **AHRTU-DNET-5A**

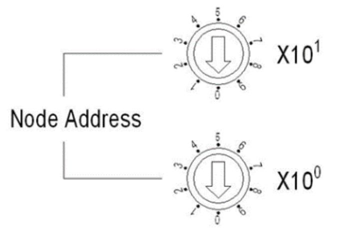
1. Profile



Number	Name	Description
1	Model name	Model name of the module
2	Seven-segment display	Display
3	Address knobs	Setting the address
4	Function switch	Setting the functions
5	DeviceNet connector	DeviceNet is used to interconnect control devices for data exchange.
6	MS LED indicator	Indicating the status of the module
7	NS LED indicator	Indicating the status of the network
8	Label	Nameplate
9	Set screw	Fixing the module
10	Connector	Connecting the module and a backplane
11	Projection	Fixing the module

2. Address knobs

It is used to set the node address of AHRTU-DNET-5A on a DeviceNet network. (Node addresses range from 0 to 63.)

Setting	Description	
0…63	Available nodes on a DeviceNet network	
64…99	Unavailable nodes on a DeviceNet network	

Example: If users want to set the communication address of AHRTU-DNET-5A to 26, they can turn the knob corresponding to $x10^1$ to 2, and turn the knob corresponding to $x10^0$ to 6.

Points for attention:

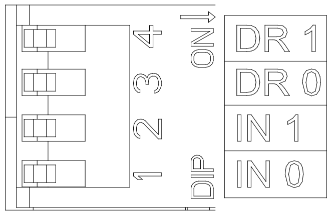
- When the power supply is cut off, the node address is set. After the setting of the node address is complete, AHRTU-DNET-5A can be supplied with power.
- If AHRTU-DNET-5A is running, changing the node address is unavailable.
- Please use a slotted screwdriver to turn the knobs with care, and do not scrape them.

3. Function switch

The function switch provides the following functions:

- Setting the working mode (IN 0)
- Setting the transmission speed of a DeviceNet network (DR 0~DR 1)

DR 1	DR 0	Transmission speed
OFF	OFF	125 kbps
OFF	ON	250 kbps
ON	OFF	500 kbps
ON	ON	Extended transmission speed
IN 1	Reserved	
IN 0	ON	Clearing the data in the internal storage in AHRTU-DNET-5A
	OFF	No action

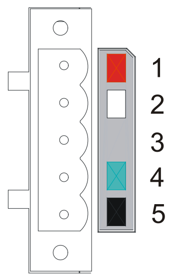


Note:

- When the power supply is cut off, the functions are set. After the setting of the functions is complete, AHRTU-DNET-5A can be supplied with power.
- If AHRTU-DNET-5A is running, changing the functions is unavailable.
- Please use a slotted screwdriver to adjust the DIP switch with care, and do not scrape them.

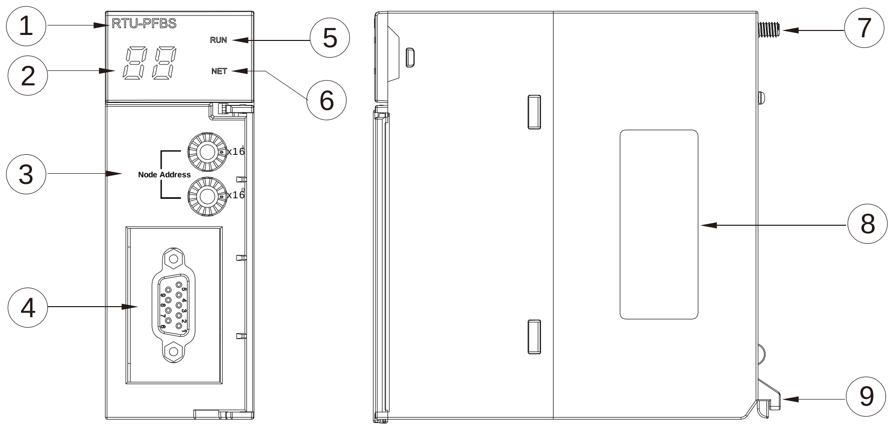
4. **DeviceNet connector**

Pin	Signal	Color	Description
1	V+	Red	24 VDC
2	CAN_H	White	Signal (positive pole)
3	SHIELD	-	It is connected to a shielded cable.
4	CAN_L	Blue	Signal (negative pole)
5	V-	Black	0 VDC



- **AHRTU-PFBS-5A**

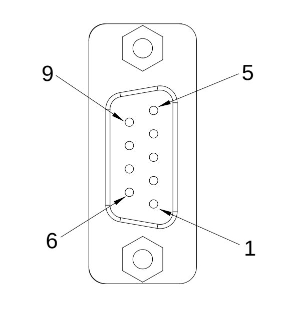
1. Profile



1. Model name	2. Seven-segment display	3. Address knobs
4. PROFIBUS-DP port	5. RUN LED indicator	6. NET LED indicator
7. Set screw	8. Label	9. Projection

2. **Definitions of the pins in the PROFIBUS-DP port**

PIN	PIN name	Description
1	--	N/C
2	--	N/C
3	RxD/TxD-P	Receiving/Sending data (P (B))
4	--	N/C
5	DGND	Data reference potential (C)
6	VP	Supply positive voltage
7	--	N/C
8	RxD/TxD-N	Receiving/Sending data (N (A))
9	--	N/C

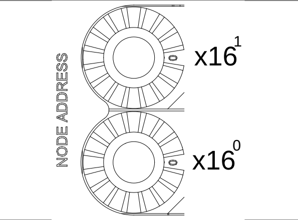


3. **Setting a PROFIBUS node address by means of the address knobs**

The address knobs of AHRTU-PFBS-5A are used for setting the node address of AHRTU-PFBS-5A on a PROFIBUS-DP network. There are two address knobs. They are a knob corresponding to $x16^0$, and a knob corresponding to $x16^1$. The range for one address knob is 0~F.

The range for setting the node address is described below.

Address	Definition
H'1~H'7D	Valid PROFIBUS address
H'0 or H'7E~H'FF	Invalid PROFIBUS address



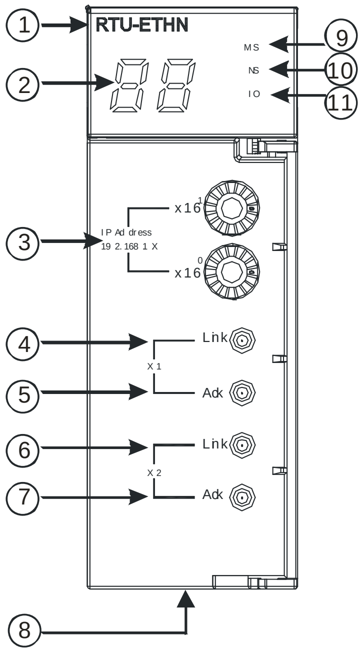
Example: If users need to set the node address of AHRTU-PFBS-5A to 26 (decimal value), they have to turn the knob corresponding to $x16^1$ to "1" and the knob corresponding to $x16^0$ to "A".
26 (decimal value)=1A (hexadecimal value)=$1x16^1+Ax16^0$.

Points for attention:

- If users set the node address of AHRTU-PFBS-5A when AHRTU-PFBS-5A is not supplied with power, they have to power AHRTU-PFBS-5A after the node address of AHRTU-PFBS-5A is set.
- If users change the node address of AHRTU-PFBS-5A when AHRTU-PFBS-5A is powered, the change will not take effect immediately after the node address of AHRTU-PFBS-5A is changed, and it will take effect after the users cut off the power supplied to AHRTU-PFBS-5A and then power AHRTU-PFBS-5A again.
- To prevent the address knobs on AHRTU-PFBS-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AHRTU-PFBS-5A.

- **AHRTU-ETHN-5A**

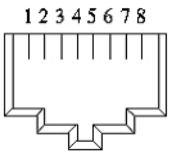
1. Profile



Number	Name
1	Model name
2	Seven-segment display
3	Address knobs
4	X1 Link indicator
5	X1 Ack indicator
6	X2 Link indicator
7	X2 Ack indicator
8	RJ45 port x1 / x2
9	MS LED indicator
10	NS LED indicator
11	I/O indicator

2. Ethernet Port

Pin definition for the Ethernet port

Pin	Signal	Description	RJ-45
1	TX+	Transmitting data (positive pole)	
2	TX-	Transmitting data (negative pole)	
3	RX+	Receiving data (positive pole)	
4	-	-	
5	-	-	
6	RX-	Receiving data (negative pole)	
7	-	-	
8	-	-	

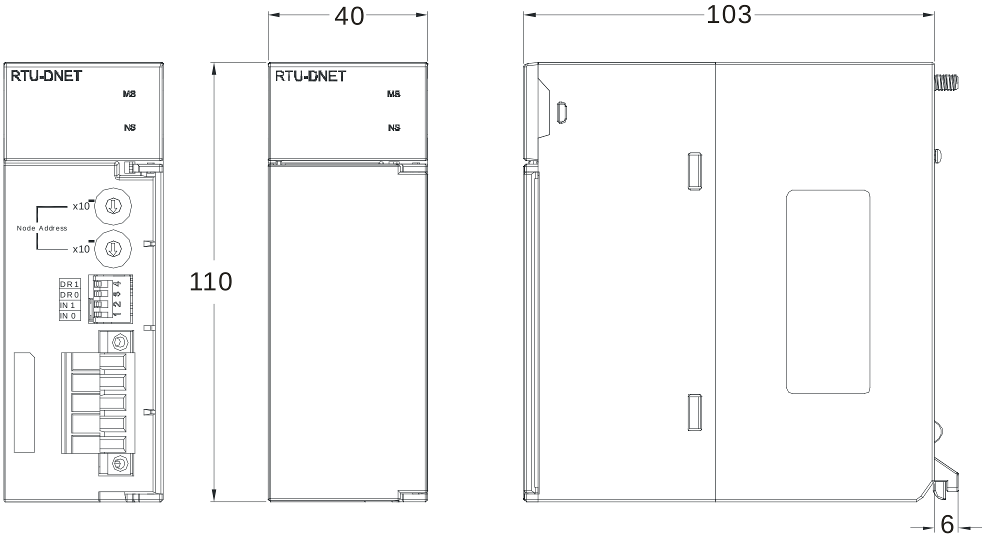
3. Address knobs

The IP address of the AHRTU-ETHN-5A series can be set via the address knobs; the default address range is 192.168.1.x and x should be set from 00 to FF.

Address	Description
00 ~ 0xFD	1. Valid IP address: 192.168.1.x, x = 1 ~ FD, (1~253) 2. 0x00: set up via EIP Builder
0xFE	Go to the firmware update mode
0xFF	Restore to factory defaults and reboot to have the defaults to take effect.

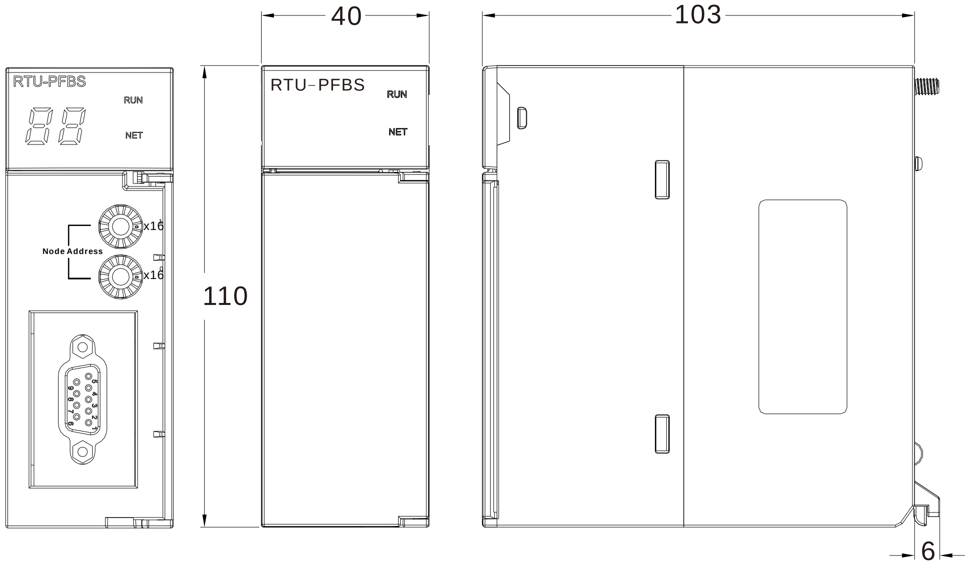
2.11.3 Dimensions

- **AHRTU-DNET-5A**



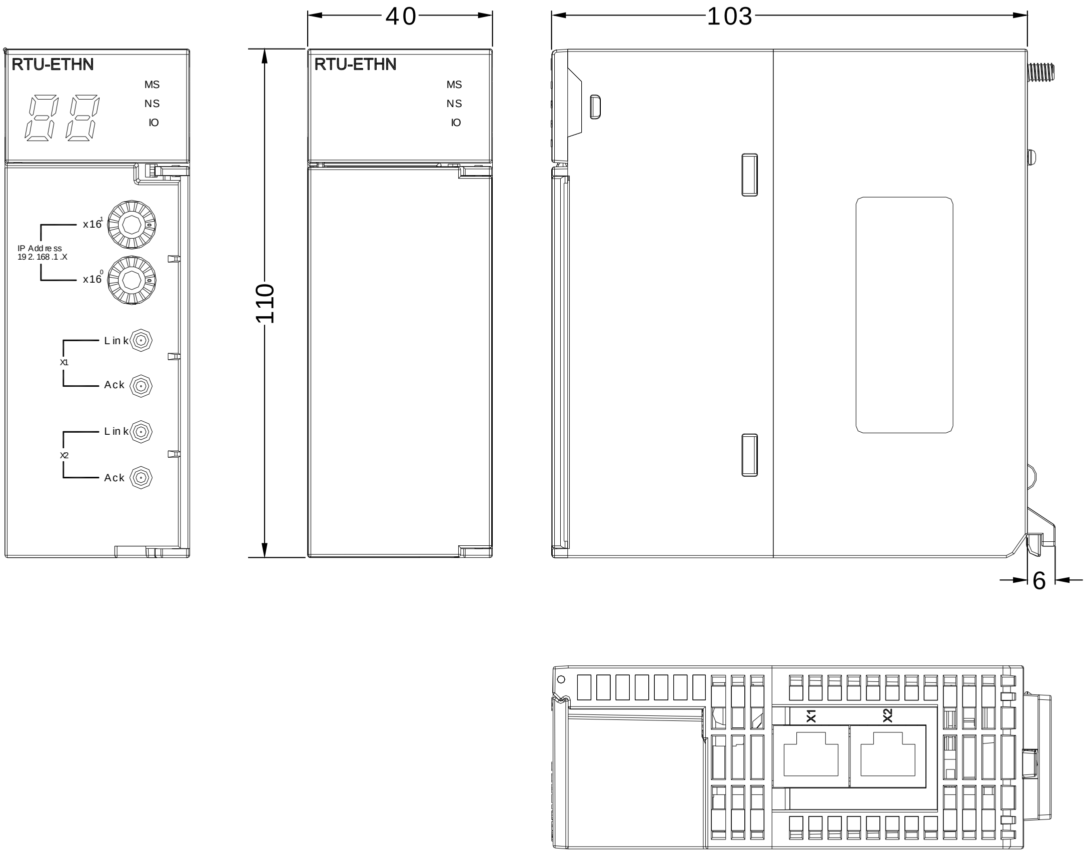
Unit: mm

- **AHRTU-PFBS-5A**



Unit: mm

- **AHRTU-ETHN-5A**



Unit: mm

2.12 Space Module and Extension Cables

2.12.1 General Specifications

- **AHAADP01EF-5A/AHAADP02EF-5A**

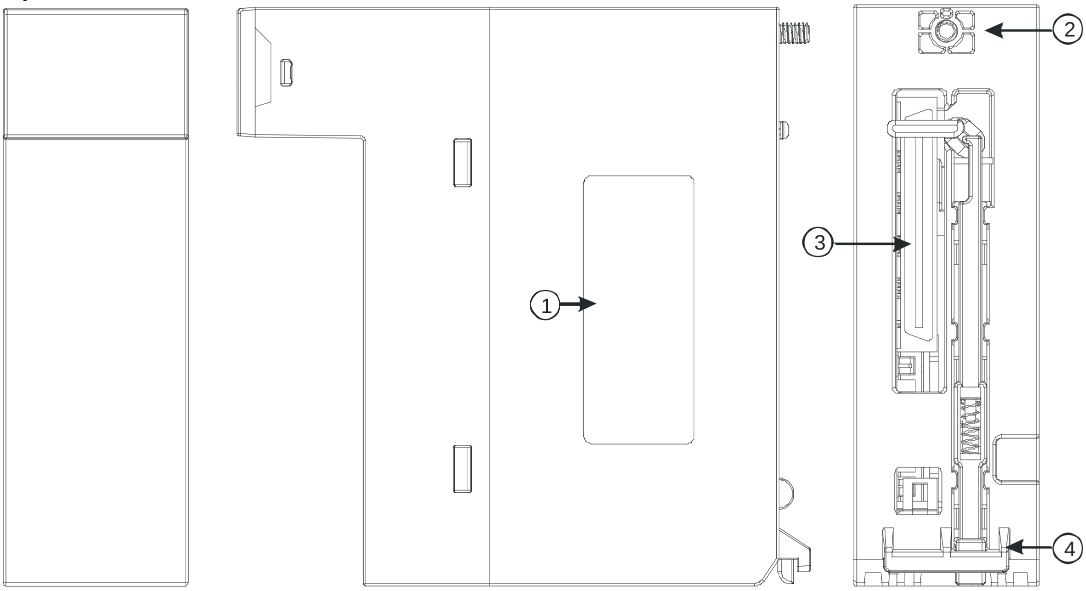
Item	Specifications
Connector type	155 Mbps 1*9 SC full-duplex optical fiber transceiver
Transmission interface	Optical fiber
Transmission speed	100 Mbps
Transmission distance	2 KM
Electric energy consumption	1.5 W
Weight	52g

- **Dust cover AHASP01-5A**

Item	Specifications
Weight	85g

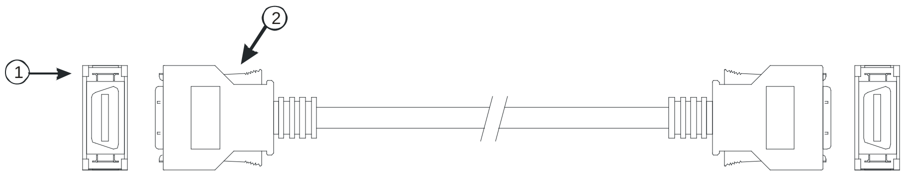
2.12.2 Profiles

- **Space module AHASP01-5A**



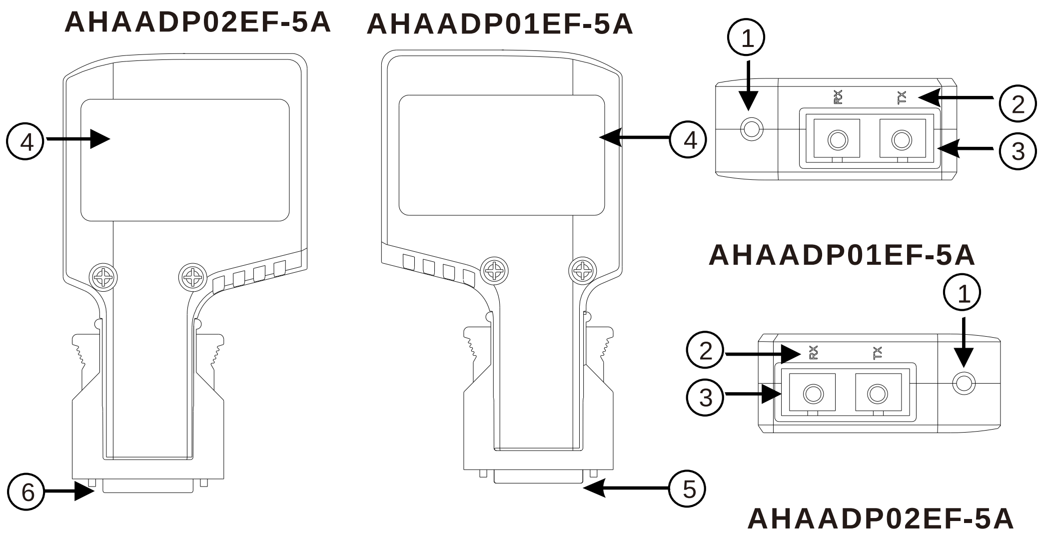
Number	Name	Description
1	Label	Nameplate
2	Set screw	Fixing the module
3	Connector	Connecting the module and a backplane
4	Projection	Fixing the module

- **Extension cable**



Number	Name	Description
1	Connector	Connecting backplanes 1. AHACAB06-5A 2. AHACAB10-5A 3. AHACAB15-5A 4. AHACAB30-5A
2	Clip	Fixing the connector

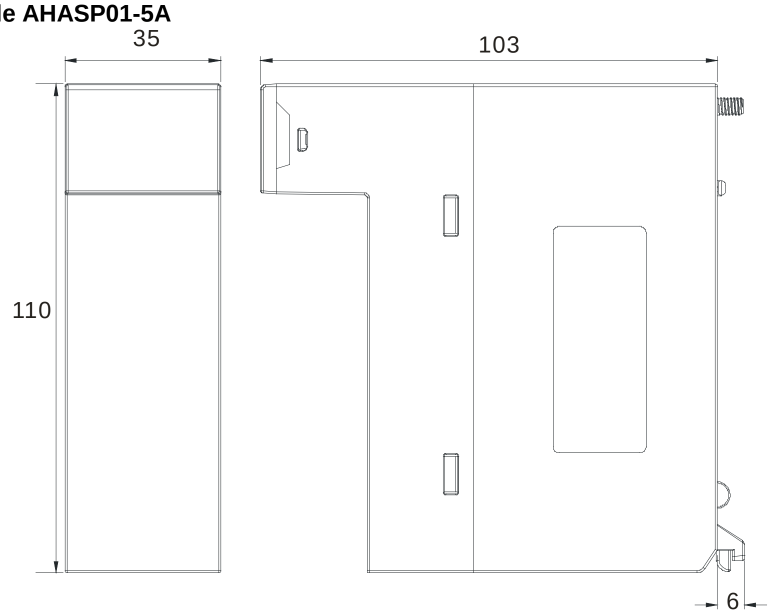
- **AHAADP01EF-5A/AHAADP02EF-5A**



Number	Name
1	Connection/Communication LED indicator
2	Descritions of the optical fiber ports (TX/RX)
3	Optical fiber ports
4	Label
5	Connector

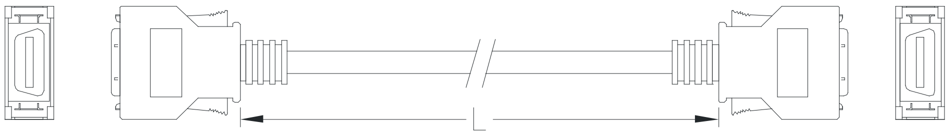
2.12.3 Dimensions

- **Space module AHASP01-5A**



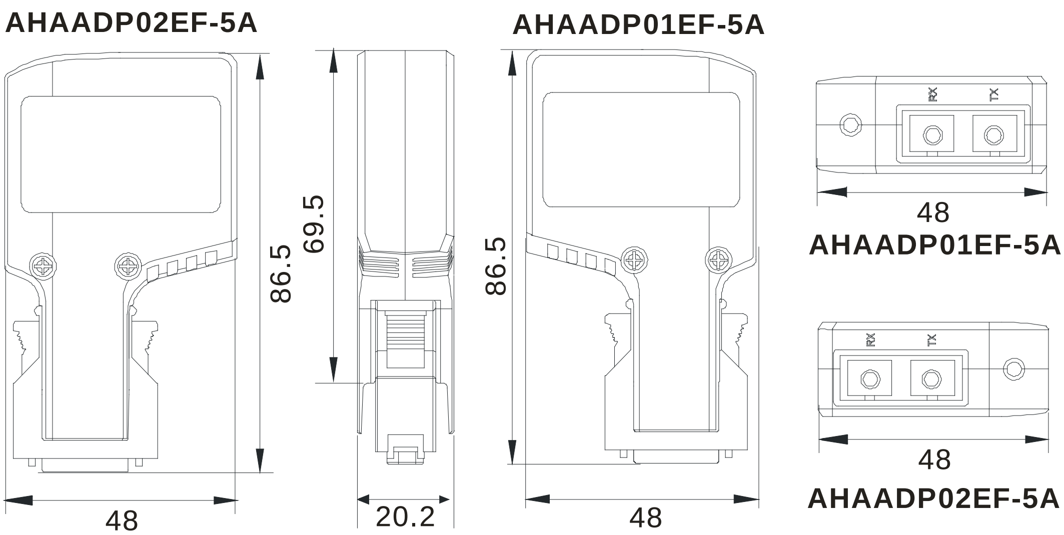
Unit: mm

- **Extension cable**



Extension cable	Length
AHACAB06-5A	0.6 m
AHACAB10-5A	1.0 m
AHACAB15-5A	1.5 m
AHACAB30-5A	3.0 m

- **AHAADP01EF-5A/AHAADP02EF-5A**



Unit: mm

MEMO

Chapter 3 Installing Software

Table of Contents

Before developing an AH500 Series system, install ISPSoft and COMMGR. ISPSoft is a software platform for integrating the hardware, network configuration, and program development for a system. COMMGR functions as middleware between a computer and devices. It functions as a communication management interface between ISPSoft and AH500 Series hardware.

3.1 Installing and Uninstalling ISPSoft

- System requirements

<table>
<tr><th>Item</th><th colspan="2">System requirement</th></tr>
<tr><td>Operating system</td><td colspan="2">Windows XP / 7 / 8 / 10</td></tr>
<tr><td>CPU</td><td colspan="2">Pentium 1.5 G or above</td></tr>
<tr><td>Memory</td><td colspan="2">256 MB or above (512 MB or above is recommended.)</td></tr>
<tr><td>Hard disk drive</td><td colspan="2">Capacity : 500 MB or above</td></tr>
<tr><td>CD-ROM drive</td><td colspan="2">This is optional for installing ISPSoft.</td></tr>
<tr><td>Monitor</td><td colspan="2">Resolution: 800×600 or above
(suggested setting: 1024x768/96 dpi)</td></tr>
<tr><td>Keyboard/Mouse</td><td colspan="2">A general keyboard/mouse or devices compatible with Windows</td></tr>
<tr><td>Printer</td><td colspan="2">A printer with a driver for Windows. This is needed to print projects.</td></tr>
<tr><td>RS-232 port</td><td>For connecting to a PLC</td><td rowspan="3">One of them is used, but a PLC that is connected must have a corresponding port. (*1)</td></tr>
<tr><td>USB port</td><td>For connecting to a PLC</td></tr>
<tr><td>Ethernet port</td><td>For connecting to a PLC</td></tr>
<tr><td>Communication software</td><td colspan="2">COMMGR, a communication manager, must be installed. (*2)</td></tr>
<tr><td>Supported Models</td><td colspan="2">AH500 series PLCs/DVP series PLCs (exclusive of DVP-PM series PLCs)/ AS series, AC motor drives: VFD with PLC built-in series, and Text panel HMI with PLC built-in series.</td></tr>
</table>

*1. ISPSoft supports several ways to connect a computer to a PLC. Make sure the port and the mode supported by the PLC are correct before you connect a computer to the PLC.

*2. Please refer to section 3.2 for more information about COMMGR.

*3. The functions and specifications mentioned above are only applicable to ISPSoft version 3.00 or above. The older versions are not equipped with complete functions.

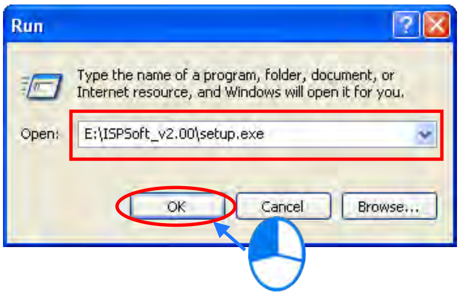
3.1.1 Installing ISPSoft

If an older version of ISPSoft has been installed on a computer, uninstall it before you install ISPSoft. Refer to section 3.1.2 for more information about uninstalling ISPSoft. The following are the steps to install ISPSoft.

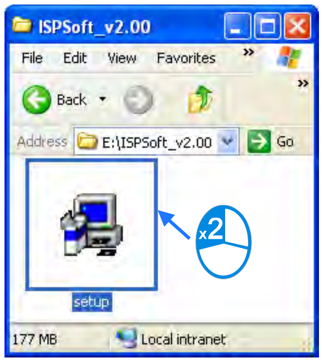
(1) Start the Windows operating system and then install ISPSoft. You may need administrative privileges to install the software.

(2) Put the ISPSoft CD in the CD-ROM drive, or download the installation program from the official Delta website http://www.delta.com. Before you install the installation program downloaded from the website, you must decompress the file.

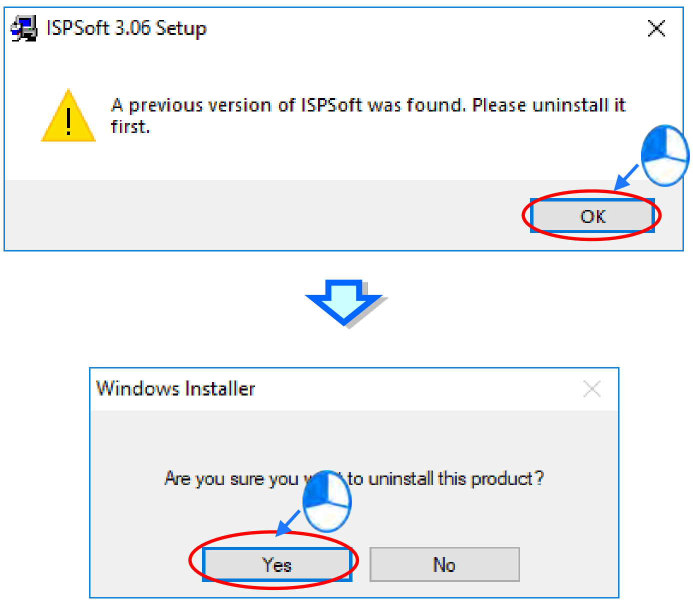
(3) Click **Start**, and then click **Run…** to open the **Run** window. Specify the path to the file called setup.exe in the **Open** box, and then click **OK**. You can also double-click the **setup** icon to execute the installation program.



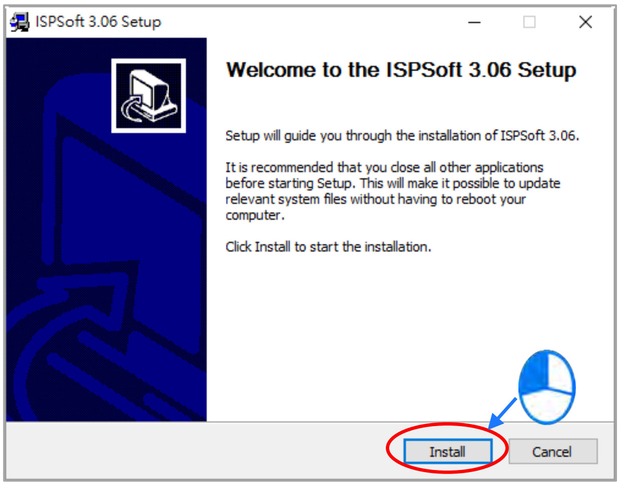
OR



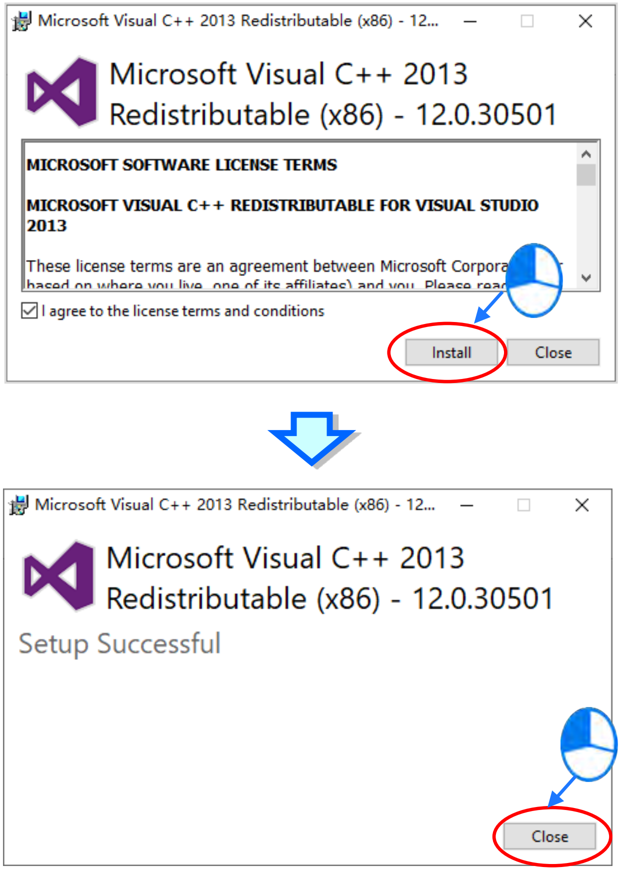
(4) When a previous version of the ISPSoft is found, click **OK** then **Yes t**o uninstall that version shown in the pop-up windows (see below).



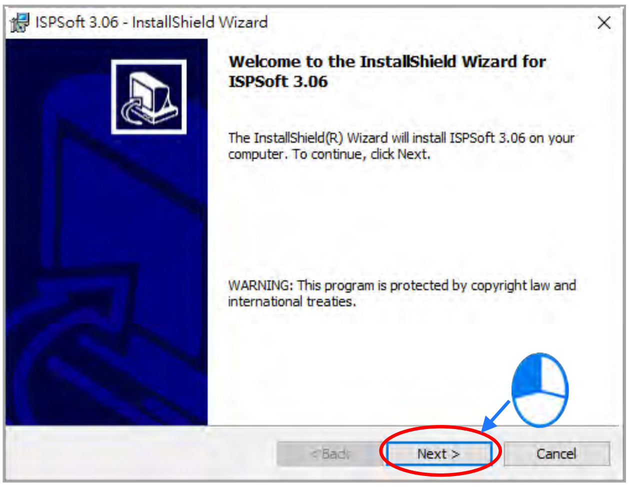
(5) Click **Install** once Shield Wizard window appears.



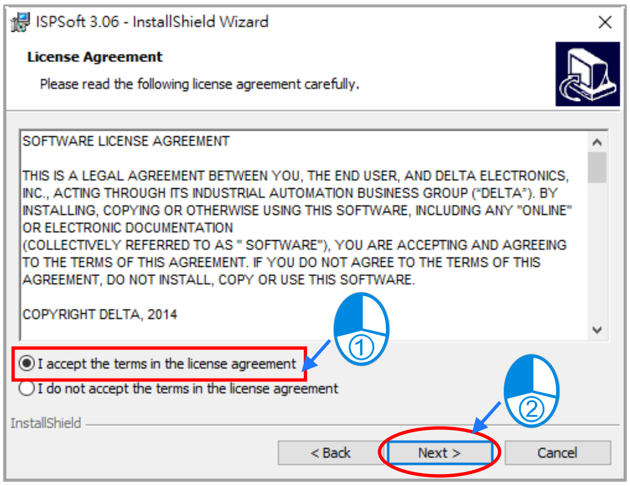
(6) The installation program detects if your computer has installed Microsoft Visual C++ 2013 or not. If not, the following installation steps will show up. Click **Install** to install and after the installation is done, click **Close**.



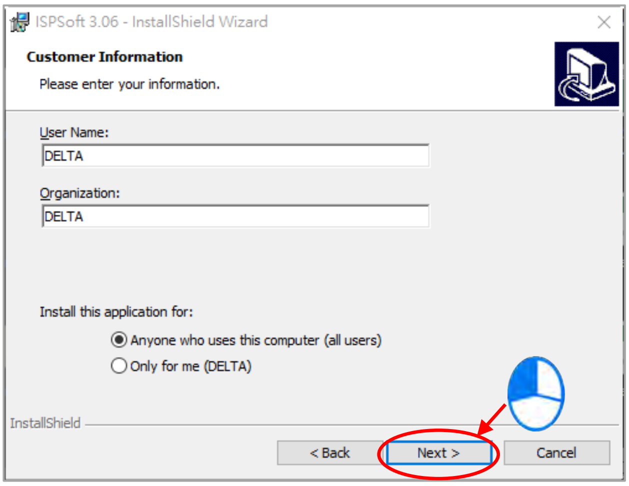
(7) After the ISPSoft x.xx – Install Shield Wizard window appears, click **Next**.



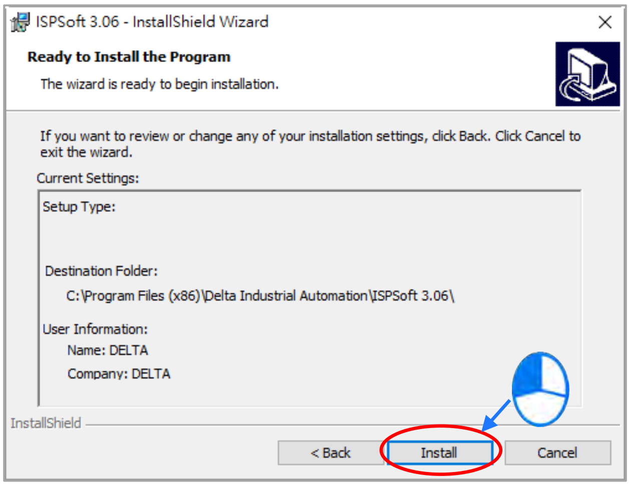
(8) Select **I accept the terms in the license agreement** and click **Next**.



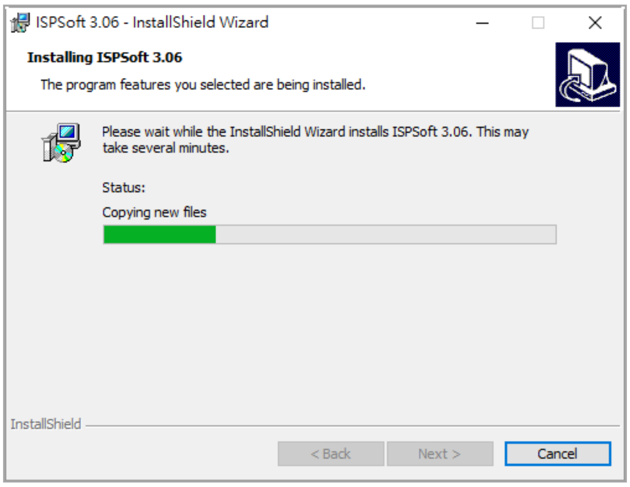
(9) Type the necessary information in the **User Name** and **Organization** boxes, and then click **Next**.

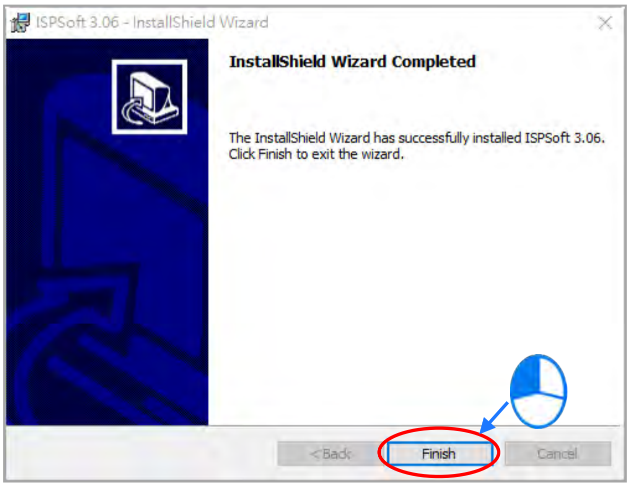


(10) Check if the installation information is correct and then click **Install**.

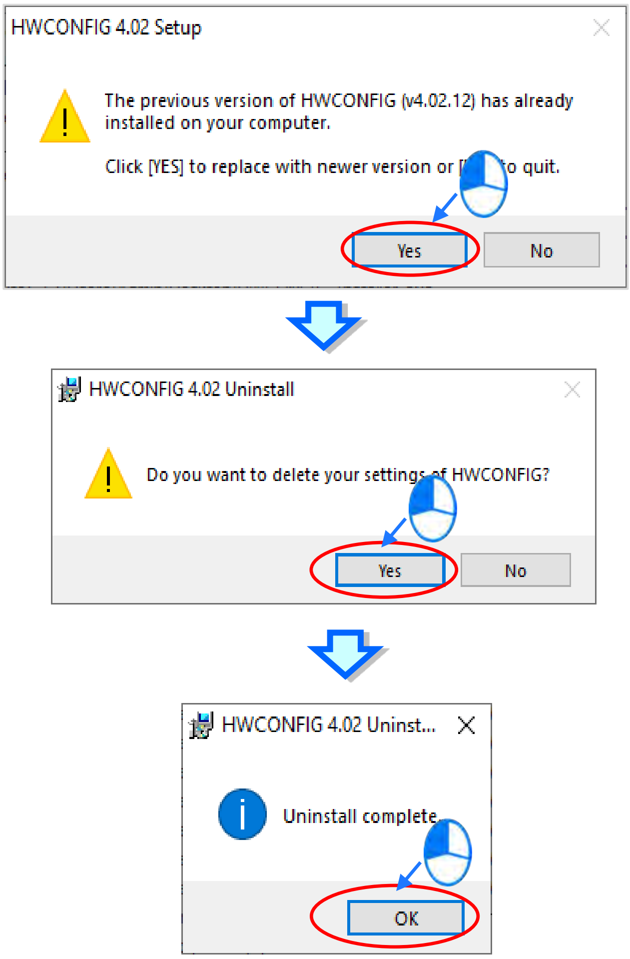


(11) After ISPSoft is installed, click **Finish** to complete the installation.



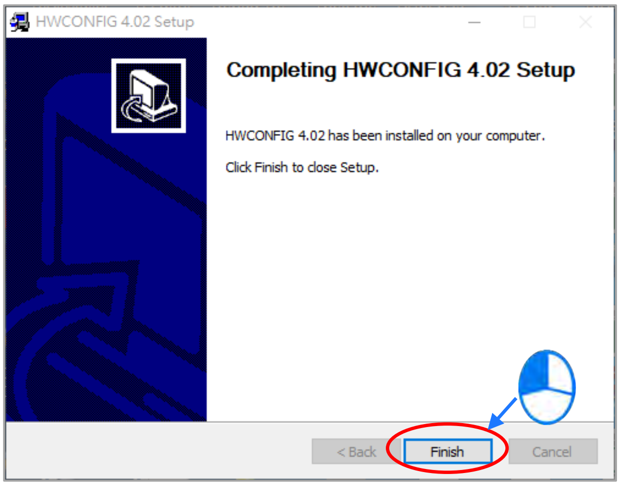


(12) Next the HWCONFIG is about to be installed. If there is a previous version of HWCONFIG installed in your computer. The following image appears. Click **Yes** to replace the previous version of HWCONFIG with a newer version.

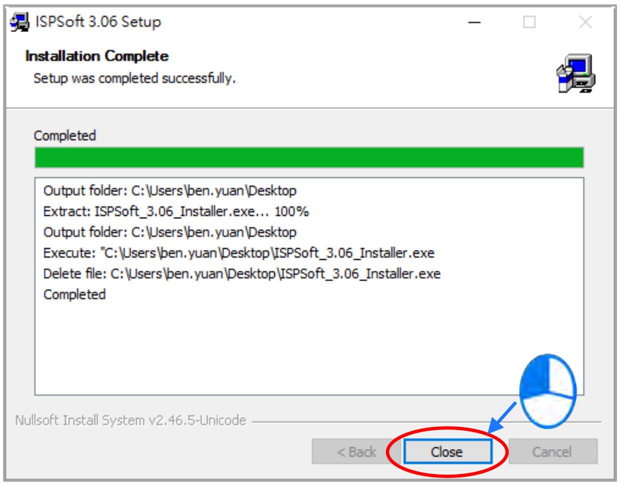


(13) Click **Install**, once the installation window appears.

(14) After HWCONFIG is installed, click **Finish** to complete the installation.



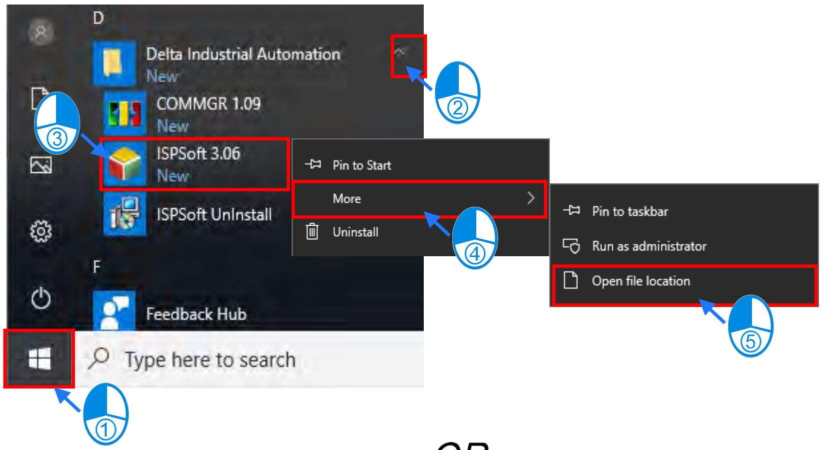
(15) After installation is done, the installation program creates shortcuts on the desktop and the Start menu. Click **Close** to complete the installation.



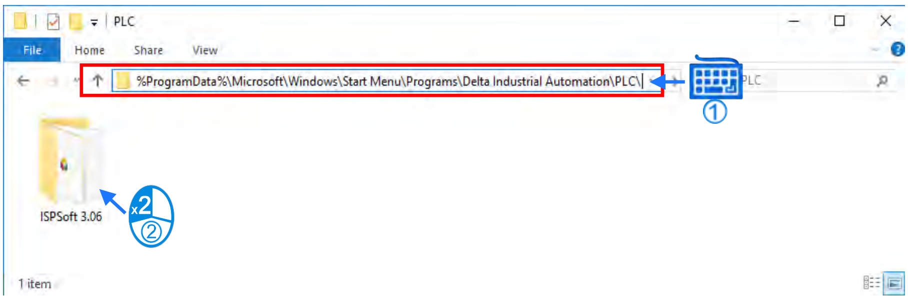
3.1.2 Uninstalling ISPSoft

(1) Generally, you can click **ISPSoft Uninstall** or select **Programs** under **Control Panel** to remove the ISPSoft; when **ISPSoft Uninstall** is not found, there are two methods to uninstall the software:

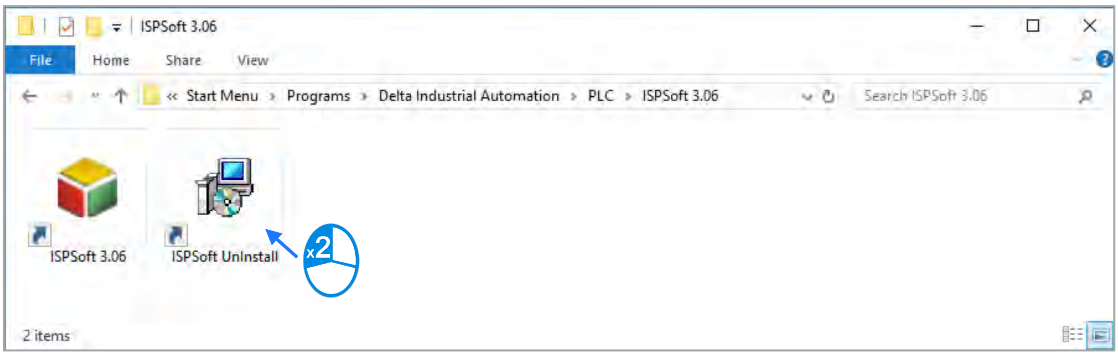
- Method 1: Select **ISPSoft x.xx** from the Windows list, click **More** then select **Open file location.**
- Method 2: Place **%ProgramData%\Microsoft\Windows\Start Menu\Programs\Delta Industrial Automation\PLC** in the address box and press Enter. Then, double click ISPSoft x.xx file.



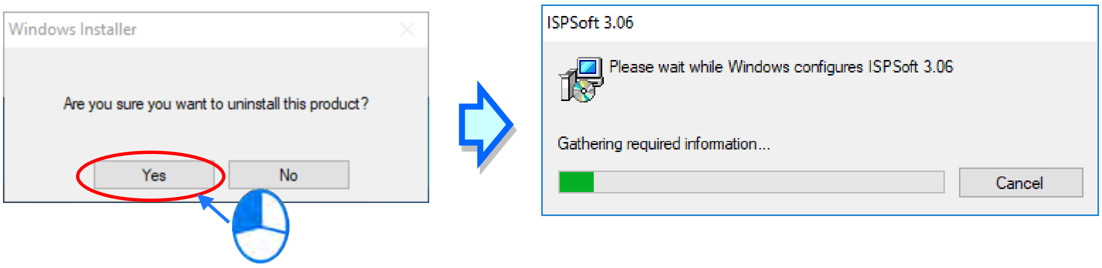
OR



(2) Remove the software by double-click the **ISPSoft UnInstall**.



(3) To uninstall ISPSoft, click **Yes** shown in the pop-up window. The window will automatically close once the software is removed.



3.2 Installing and Uninstalling COMMGR

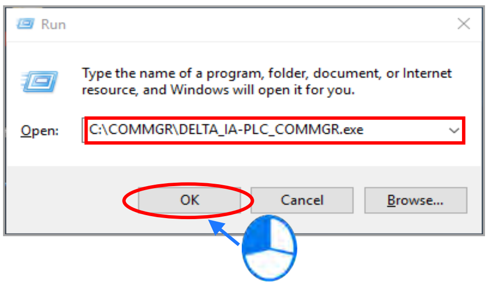
3.2.1 Installing COMMGR

COMMGR is a software independent of ISPSoft. It must be installed separately. When the previous version of COMMGR is detected in a computer, that version is advised to be uninstalled first before the latest COMMGR can be installed.

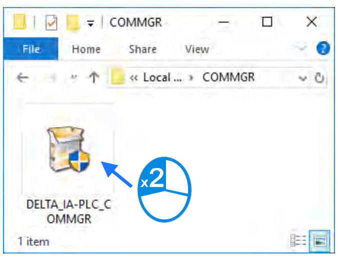
(1) Start a computer and enter the Windows operating system. You need to log on to the system as a system administrator before installing COMMGR.

(2) Put a COMMGR CD in the CD-ROM drive, or download the installation program from official Delta website http://www.deltaww.com/. Before you install the program downloaded from the website, you must decompress the file.

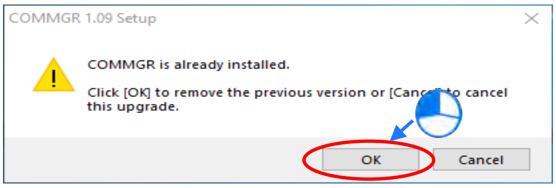
(3) Click **Start**, and then click **Run…** to open the **Run** window. Specify the path to the file called setupComm.exe in the **Open** box, and then click **OK**. Alternatively, you can double-click the icon which is used to install COMMGR to execute the installation program.

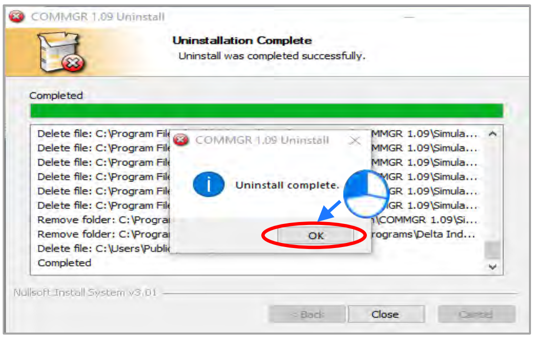


OR

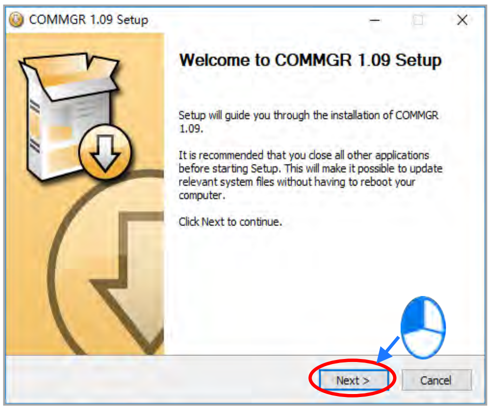


(4) When the previous version of COMMGR is installed, click **OK** to remove that version shown in the pop-up window (see below) and when uninstall is complete, click **OK** again.

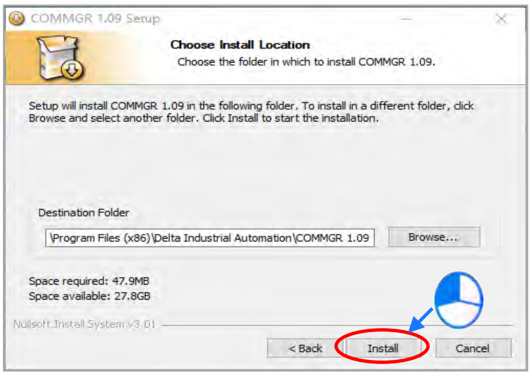




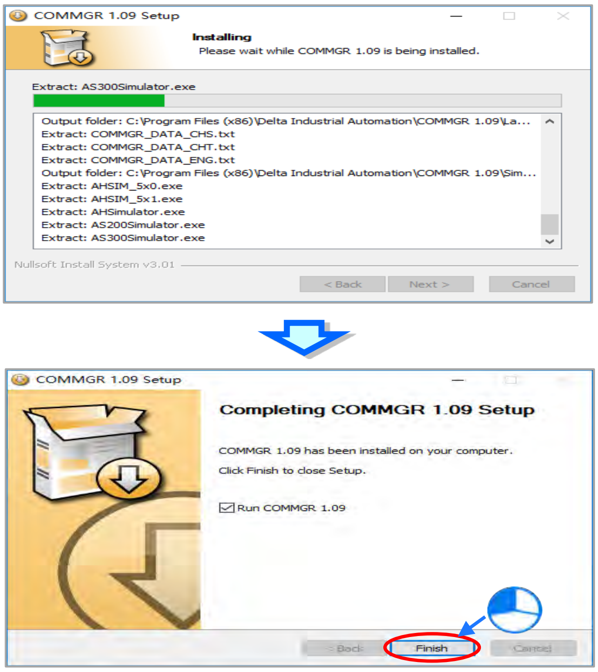
(5) Click **Next** after the Setup window appears.



(6) Use default setup in the destination folder. Click **Install** to start the installation.

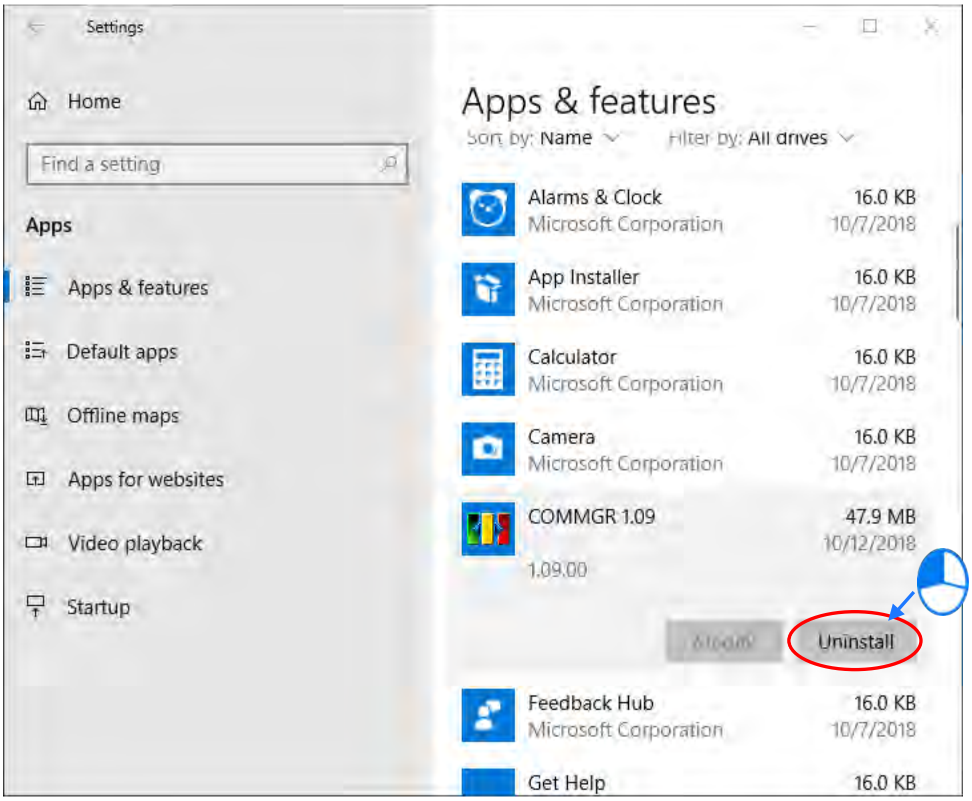


(7) After you install COMMGR, the installation program creates a shortcut to the program on the **Start** menu. Click **Finish** to complete the installation.

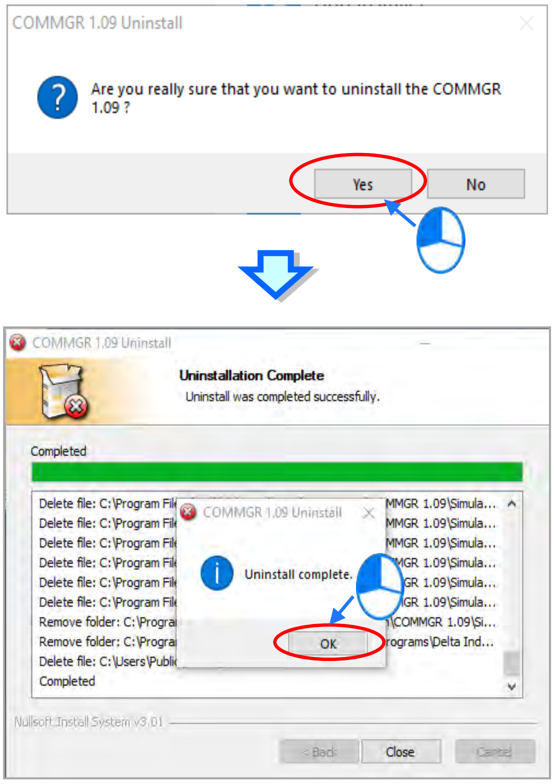


3.2.2 Uninstalling COMMGR

(1) Enter the settings of **Apps & features** in Windows, select **COMMGR x.xx** and click **Uninstall**.



(2) Click **Yes** and then **OK** to complete COMMGR uninstallation.



MEMO

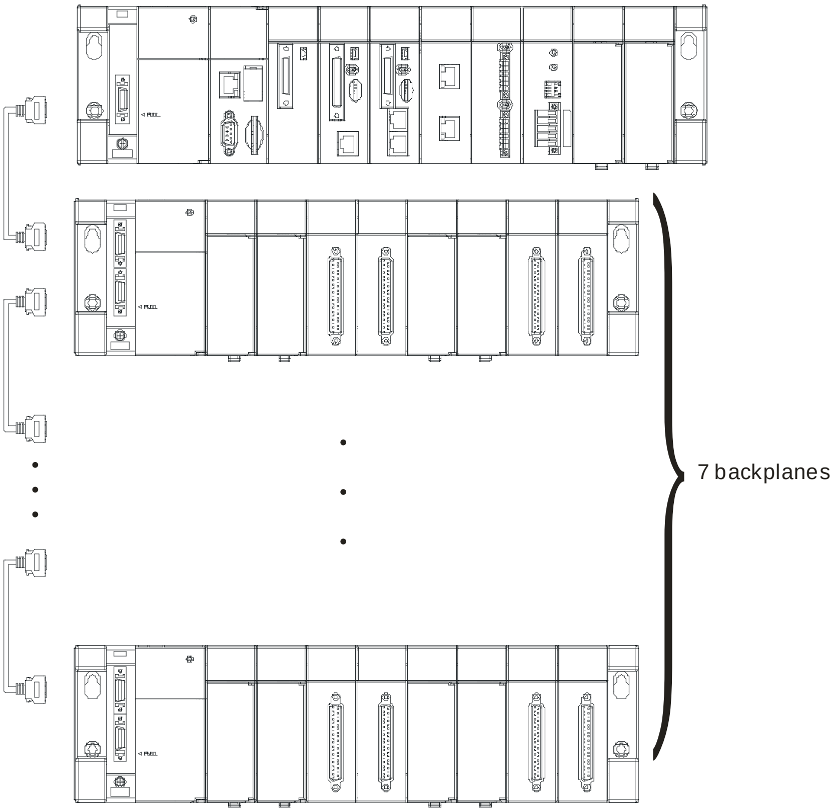
Chapter 4 Installing Hardware and Wiring

Table of Contents

4.1 AH500 Hardware Framework

4.1.1 Component Parts of AH500 Hardware

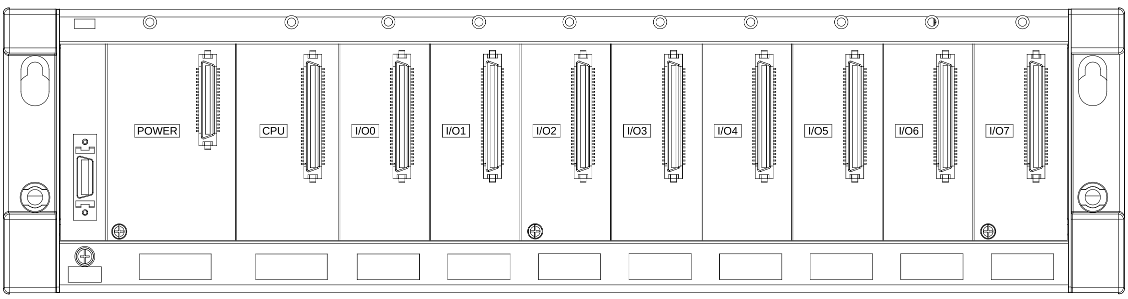
A complete AH500 system consists of a main backplane, extension backplanes, power supply modules, a CPU module, I/O modules, and extension cables. The basic AH500 system is illustrated below.



4.1.1.1 Necessary Components

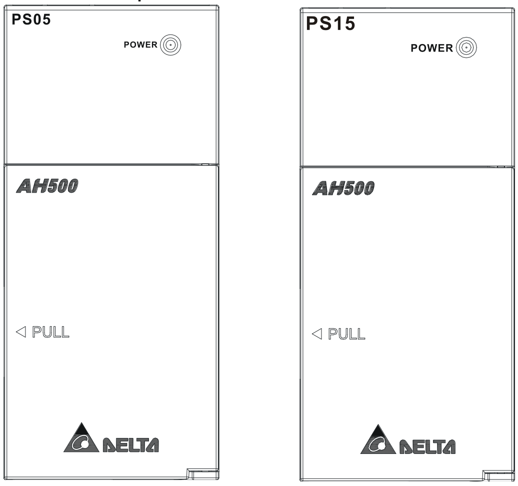
A complete AH500 system consists of the following four necessary components.

- **Main backplane**
  A CPU module and other modules are installed on a main backplane which provides the function of connecting buses. The main backplanes are divided into four types according to the number of I/O modules installed on the main backplanes. These four types are four-slot main backplanes, six-slot main backplanes, eight-slot main backplanes, and twelve-slot main backplanes. Besides, a CPU module installed on a main backplane can be replaced by a RTU module on a control network. Please notice that there is at least one CPU module on a control network.



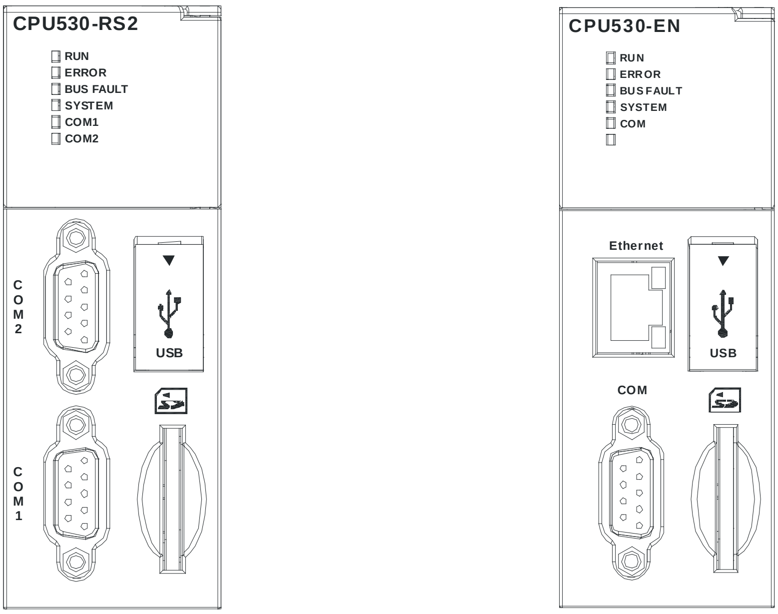
- **Power supply module**

  A power supply module functions to convert alternating current to direct current, or directly provides direct current. It provides power for the modules installed on it. A backplane must be assigned a power supply module whether it is a main backplane or an extension backplane. A power supply module has to be installed on the left-most side of a backplane.



- **CPU module**

  A CPU module is the nucleus of a complete AH500 system. It is responsible for controlling and managing the whole system, and is installed in the second slot from the left on the main backplane. Besides, Delta Electronics, Inc. provides businesses with several types of CPU modules. Users can select a CPU module according to their needs.



- **Communication cable**
  Several communication interfaces are built in a CPU module, and users are provided with many types of network modules. Users can select a suitable Communication cable according to the actual situation. Please refer to the following table for information about the communication interfaces and the main applications. The specifications for the interface on an extension backplane are defined by Delta Electronics, Inc. itself. The interface is used to connect the backplanes, and users need to use a Delta extension cable.

Interface	Connector	Application
Communication port	DB9, European terminal block	Computer/HMI communication/Industrial control network; AH500 series basic CPU modules (DB9): can act as RS-232/422/485; AH500 series advanced CPU modules (DB9): can act as RS-232/422/485; AH500 Series redundant CPU modules (European terminal block): can act as RS-232/485
Ethernet	RJ45	Computer/HMI communication/Remote control/Data exchange/Industrial control network
USB	Mini USB	Computer communication
DeviceNet	DeviceNet	Industrial control network The maximum data transmission rate is 1 Mbps.
Interface on an extension backplane	Delta connector	Extension cable for a complete AH500 system

4.1.1.2 Accessories

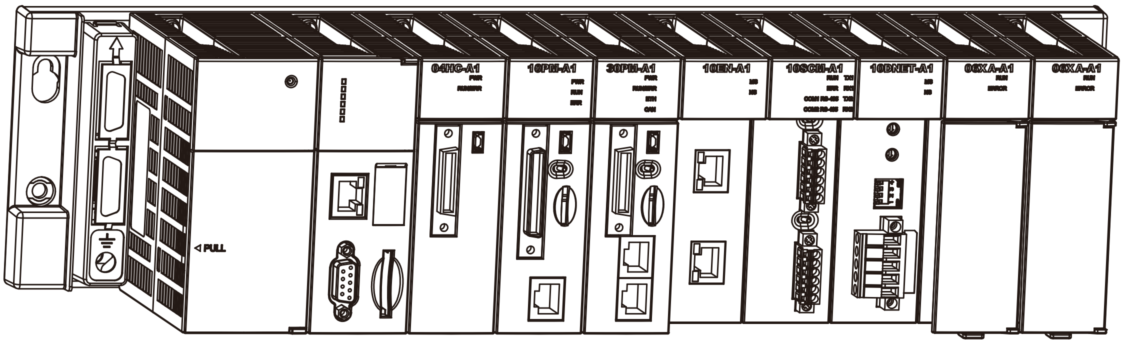
The following are the accessories for an AH500 system. Users can select them according to their needs.

- **Extension module**
  Apart from the standard communication ports on a CPU module, the CPU module does not equipped with other I/O functions. If users want to use I/O functions, they can select suitable modules according to the actual situation. The modules which can be used with an AH500 system are listed in section 1.1.2.

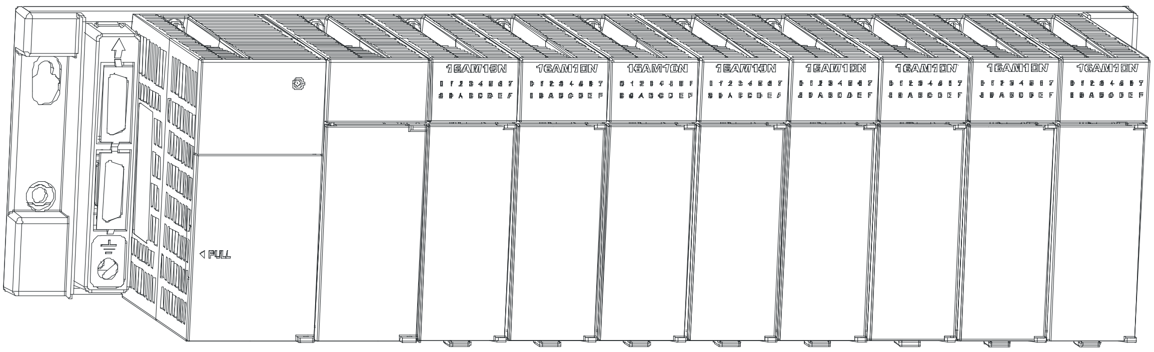
4.1.2 Installing Modules on a Main Backplane

For a main backplane as a master, the first slot from the left is for a power supply module, the second slot is for a CPU module, and the slots following the second slot are for extension modules. All AH500 series extension modules can be installed on a main backplane. Eight AH500 series network modules at most can be installed on a main backplane, but no limits are imposed on the number of other modules which can be installed on a main backplane. No limits are imposed on the installing of modules except that a power supply module and a CPU module have to be installed in the first slot and the second slot respectively. Therefore, users can configure the hardware by themselves. Besides, twelve extension modules at most can be installed on a main backplane.
For a main backplane as a RTU, the second slot is for a RTU module, and only digital input/output modules, analog input/output modules, temperature measurement modules and AH10SCM-5A/AH15SCM-5A are supported. For redundant main backplane hardware installment, refer to AH500 Redundancy System Operation Manual.

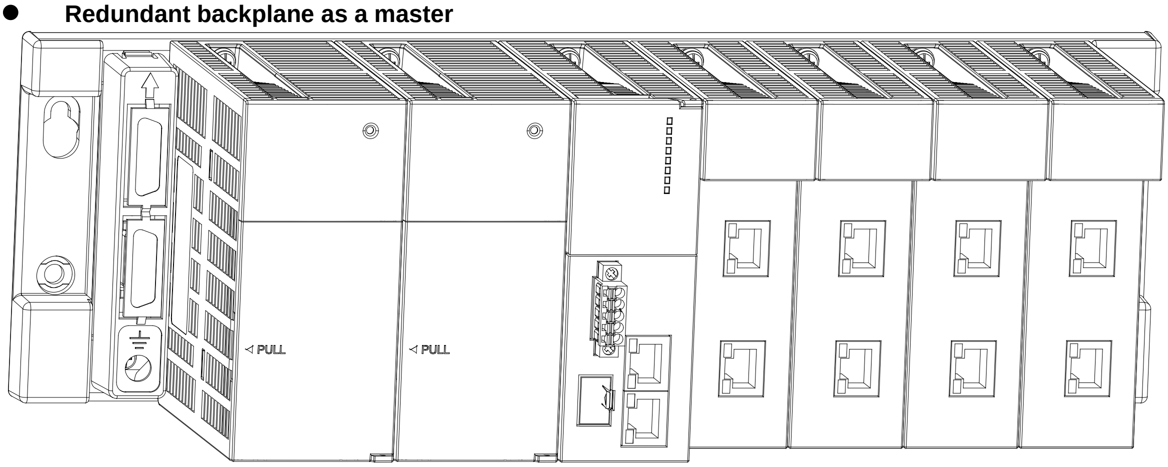
- **Main backplane as a master**



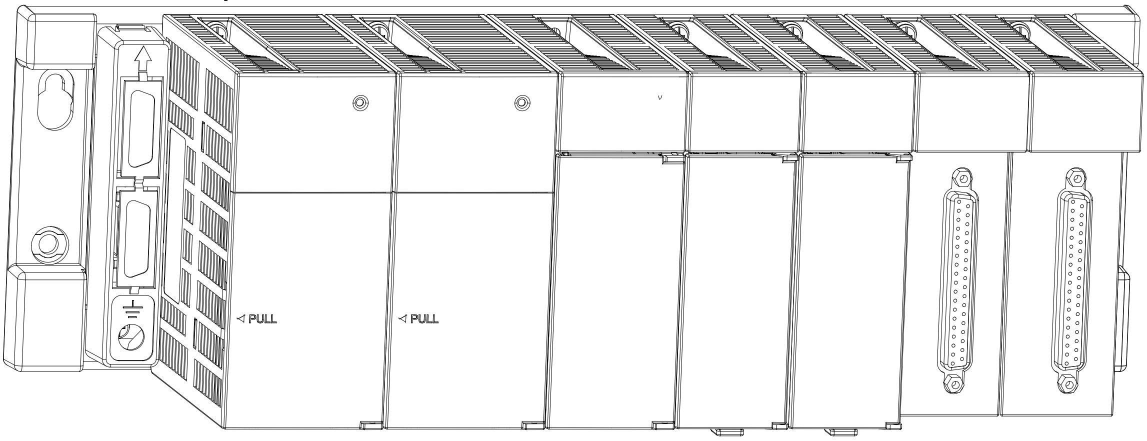
- **Main backplane as a RTU**



- **Redundant backplane as a master**



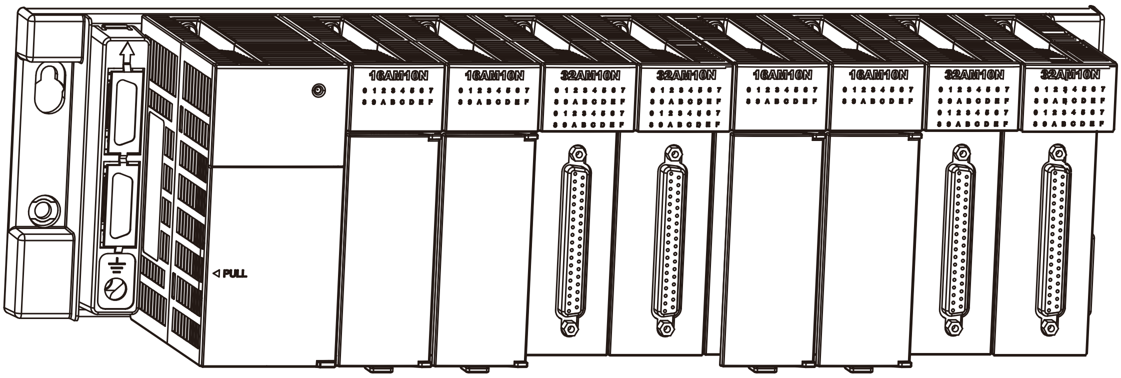
- **Redundant backplane as a RTU**



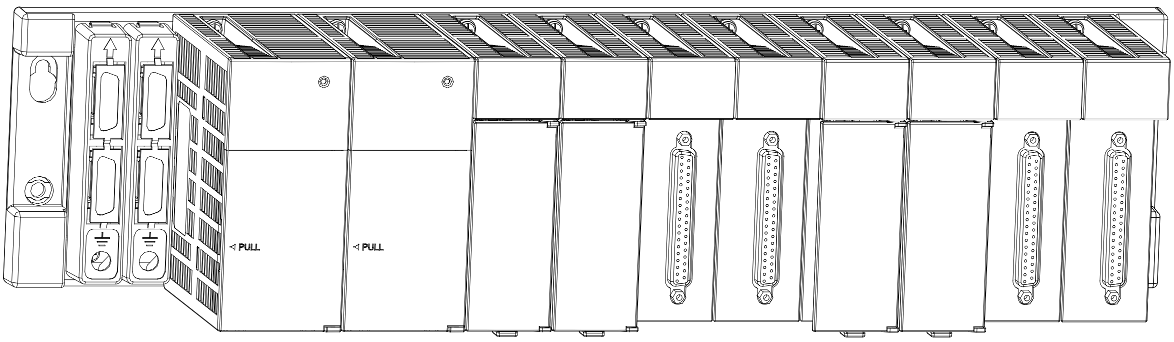
4.1.3 Installing Modules on an Extension Backplane

For an extension backplane, the first slot from the left is for a power supply module, and the slots following the first slot are for extension modules. Only digital input/output modules, analog input/output modules, temperature measurement modules, and AH10SCM-5A/AH15SCM-5A can be installed on an extension backplane. Besides, users do not need to arrange the extension modules in a specific order.

- **Extension backplane**



- **Redundant extension backplane**



4.1.4 Connecting a Main Backplane to an Extension Backplane

A main backplane can be connected to an extension backplane through the interface on the left side of the main backplane, the interface on the left side of the extension backplane, and a Delta extension cable. For a CPU module or a RTU, a main backplane can be connected to seven extension backplanes at most through the interfaces on the backplanes. Therefore, if there is a CPU module and there are several RTUs, not only the CPU module can be connected to seven extension backplanes, but also every RTU can connect to seven extension backplanes.

There are two ports on an extension backplane. The upper port is used to connect to a superior backplane, and the lower port is used to connect to an inferior backplane.

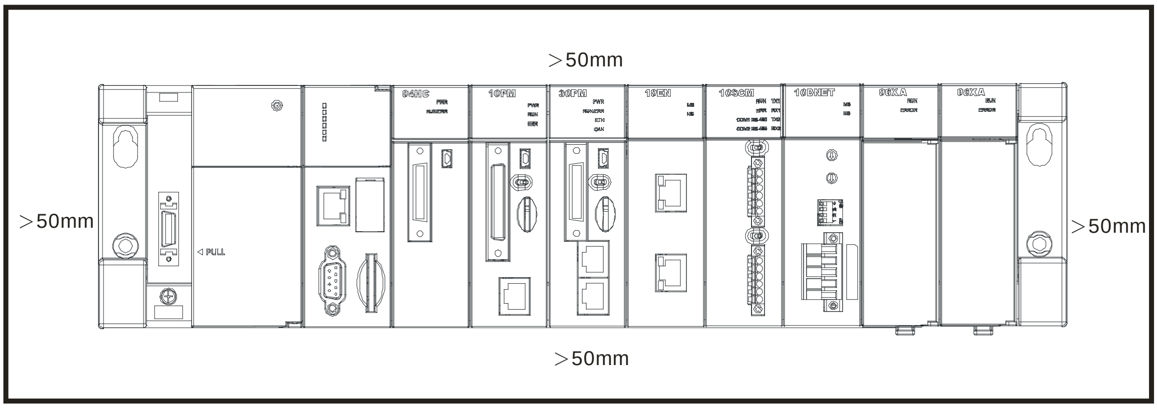
4.2 Warning

- An AH500 system only supports the horizontal installation, and a power supply module has to be installed on the left-most side of a backplane.
- Before a module is installed, please make sure of the size of the module and that of a backplane. To prevent the misestimate from resulting in insufficient installation space, the size of the connector of a communication cable, and the room which needs to be reserved have to be taken into account.
- Please make sure that the work environment conforms to the specifications for the products. It is necessary to take account of the basic temperature/humidity control and the dust/corrosion prevention.
- The electromagnetic interference will result in the wrong action of the whole system. Therefore, users have to do EMC design carefully. Please refer to Appendix C in this manual for more information related to EMC standards.
- If the specifications for the components such as screws and washers are noted specifically in the manual, please use the components conforming to the specifications.
- If a cable is connected to a communication port, please make sure that the connector of the cable is joined to the port on the module properly.
- A backplane has to be mounted on a plane stably instead of being just set on the plane. After it is installed, please make sure that it is fixed on the plane.

4.3 Installation

4.3.1 Installation of Modules in a Control Box

A PLC has to be installed in a closed control box. In order to ensure that the PLC radiates heat normally, the space between the PLC and the control box has to be larger than 50 millimeters.



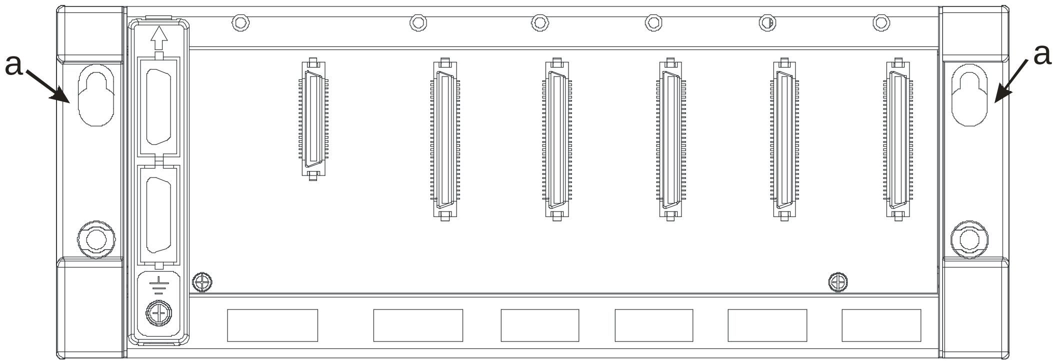
- Please keep the PLC away from high-voltage equipment, high-voltage wires, and high-voltage motors.
- In order to prevent the temperature of a PLC from rising, please do not install the PLC vertically on the bottom/top in the control box.
- Please install a PLC horizontally in the control box, as shown above.
- If users intend to increase the number of modules, they have to leave some space for installing the modules in the control box.

4.3.2 Mounting a Backplane

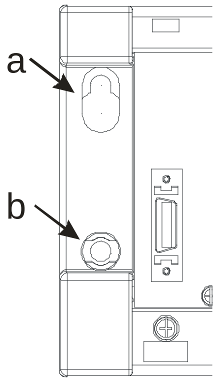
- **Fixing a backplane by screws**

  Please mount a backplane on a plane by means of M5 screws, as illustrated below. To fix the backplane, users need to judge the length of a screw, the size of a thread, and whether to use a nut according to the actual condition of the plane unless there are specific specifications for a screw which are indicated in the pictures below.

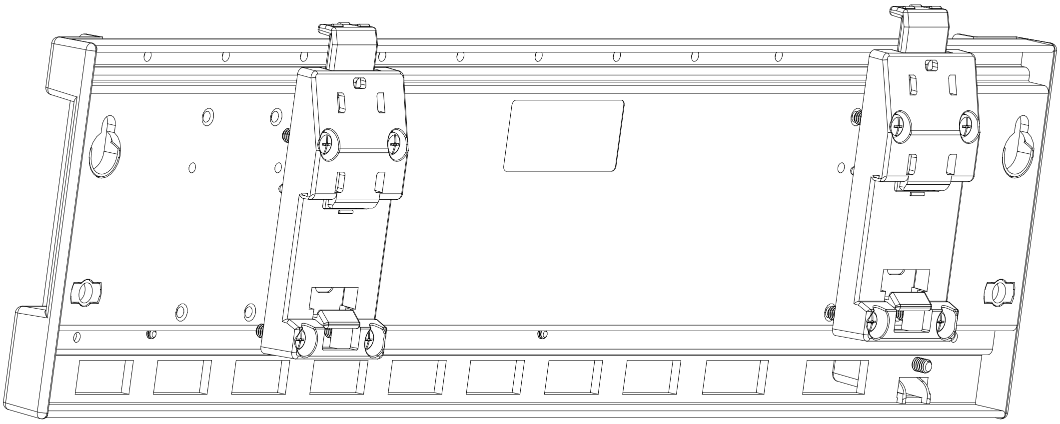
  1. Tighten the M5 screws in the holes indicated by **a**.



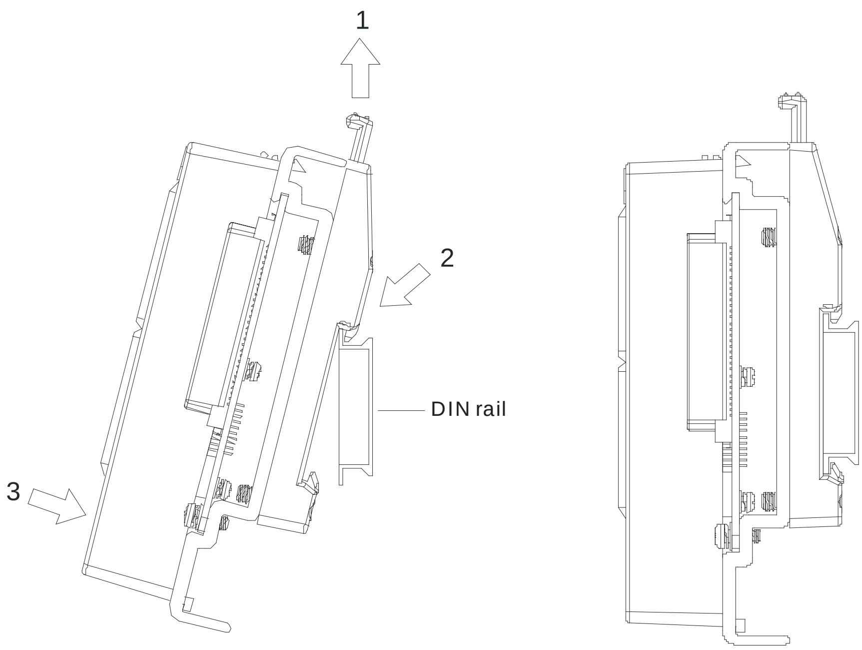
2. Tighten the two screws in the holes indicated by **b**.



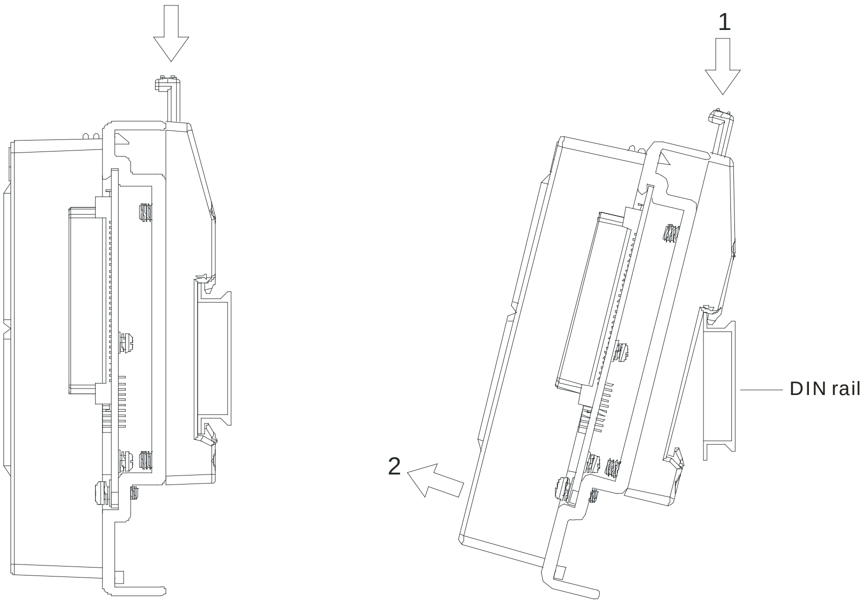
- **Installing a DIN rail**
  1. The installation is applicable to a 35 millimeter DIN rail.
  2. Install the mounting clips on a backplane.



  3. Install the backplane on a DIN rail.
     Step 1: Pull the clasp in the direction indicated by the arrow.
     Step 2: Hang the backplane on a DIN rail.
     Step 3: Press the clasp.



- **Removing a DIN rail**
  Step 1: Press the clasp in the direction indicated by the arrow.
  Step 2: Remove the backplane.



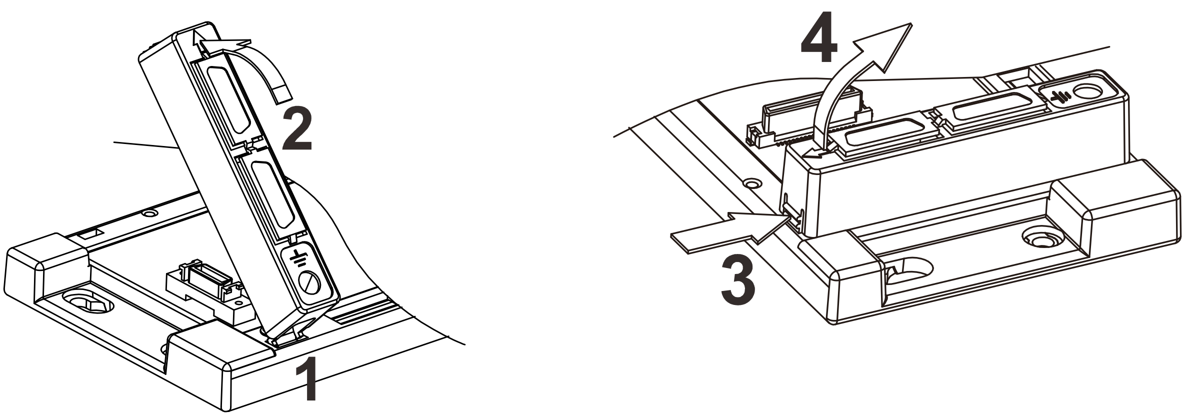
4.3.3 Installing a Dust Cover

- Installing a dust cover :

Hook the dust cover onto the lower slot indicated by ”1“.
Press the cover down in the direction as “2” indicated and then press the cover click indicated by ”3“ to have it clicked into the upper slot.

- Remove the dust cover:

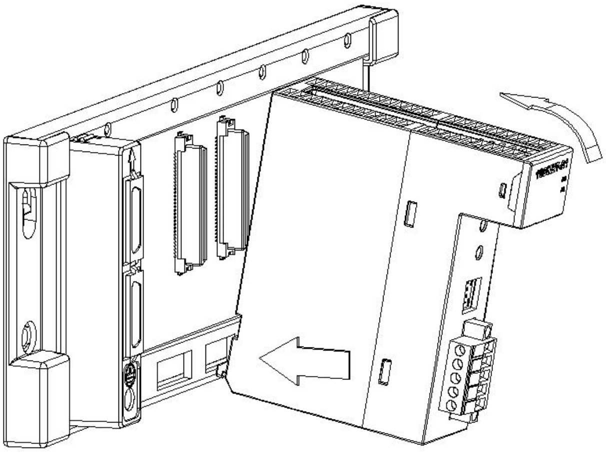
Press to release the cover click indicated by ”3“ from the upper slot and pull it up in the direction as “4” indicated.



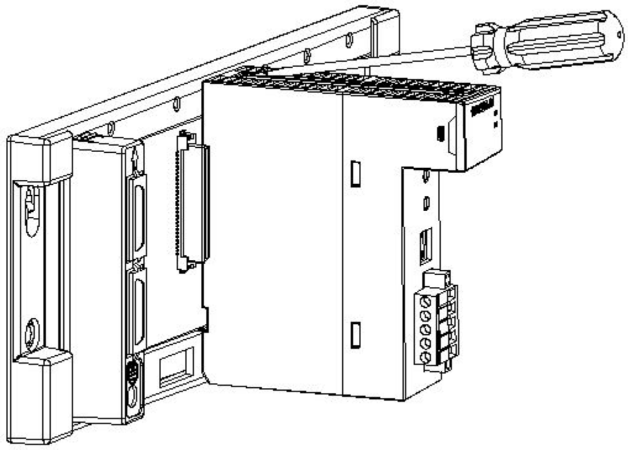
4.3.4 Installing a Module

Insert a module into a slot, make sure that the module is installed on the backplane properly, and tighen the the screw, as illustrated below.

1. Insert the projection under the module into the hole in the backplane.
2. Push the module in the direction indicated by the arrow until it clicks.



3. Tighten the screw on the module.

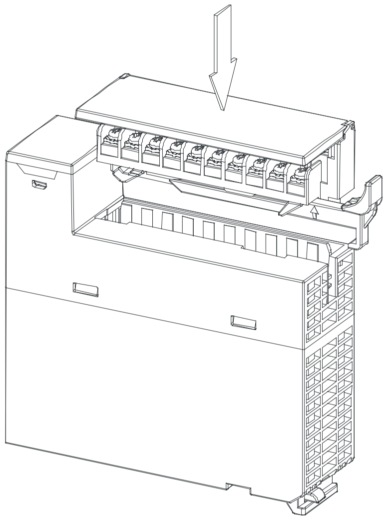


4.3.5 Installing a Removable Terminal Block

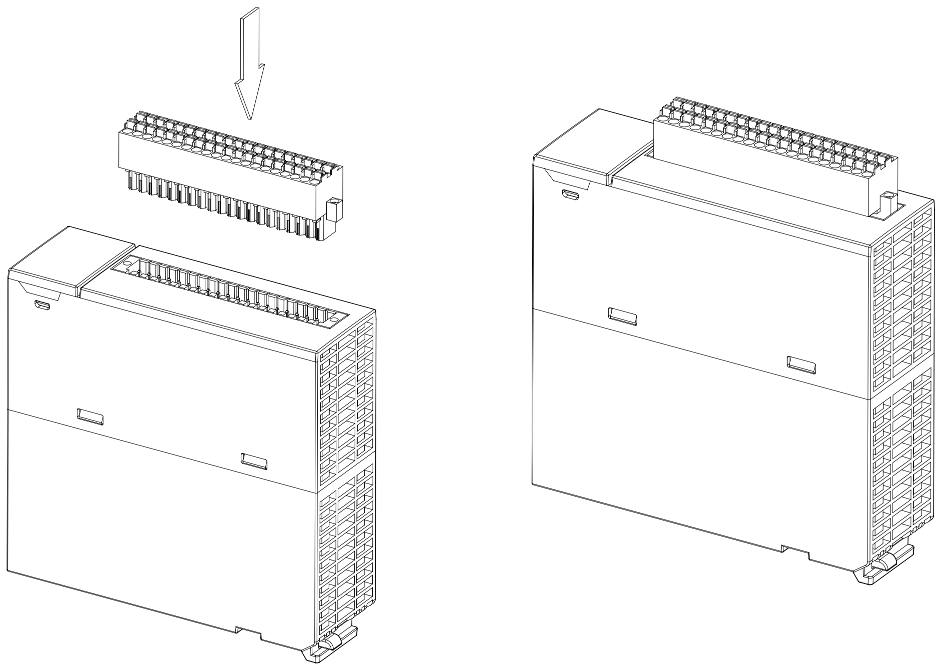
- **Installation**

1. Level a terminal block at the printed circuit board, and press it into the module.

   - **Type I**

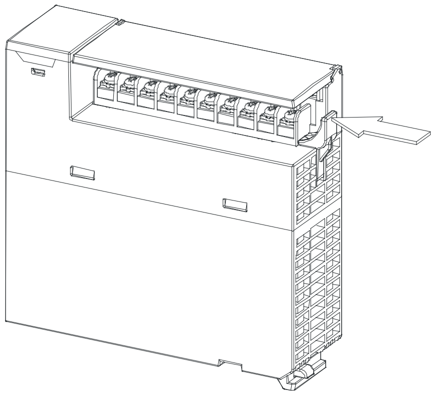


   - **Type II**

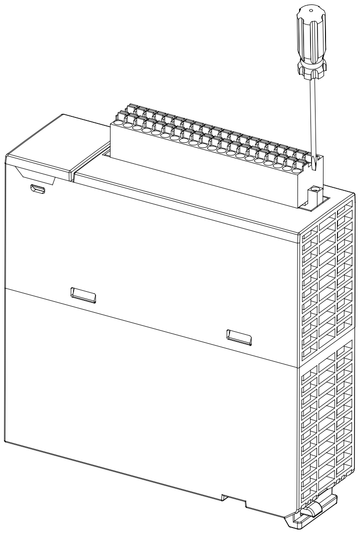


2. Press the clip in the direction indicated by the arrow. Secured the high-density terminal block with screws.

- Type I



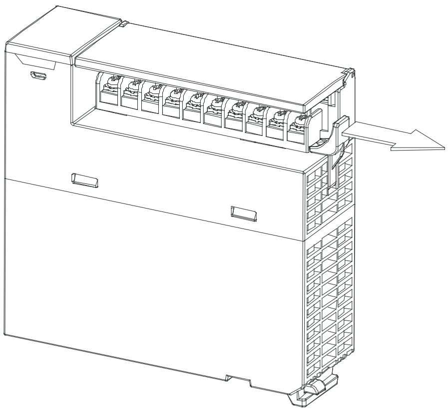
- Type II

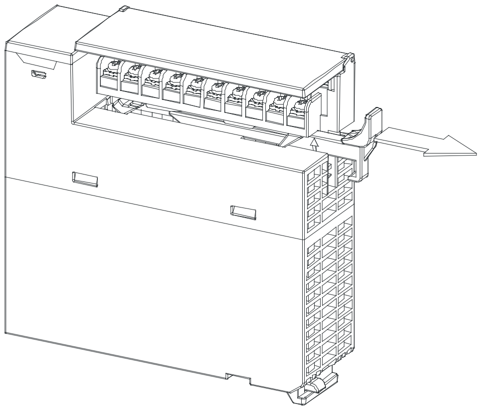


- **Removal**

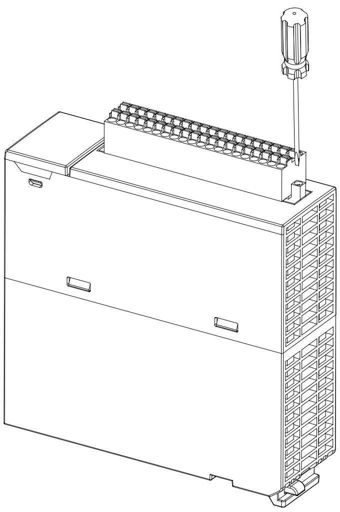
1. Pull the clip in the direction indicated by the arrow. Unscrew the screws used on the high-dentisy terminal blocks.

- Type I



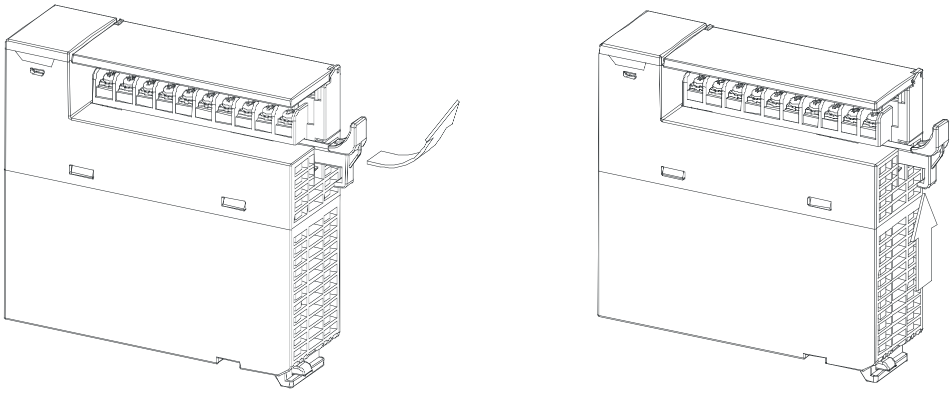


- Type II

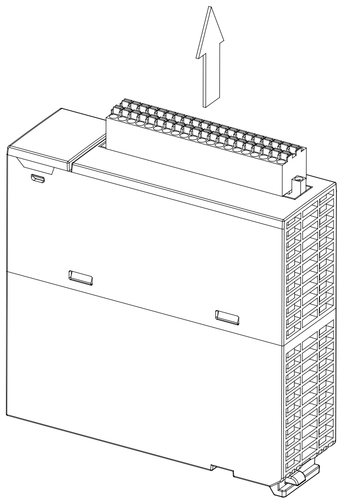


2. Pull up the clip.

- **Type I**

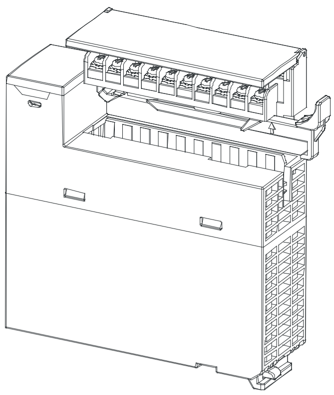


- **Type II**

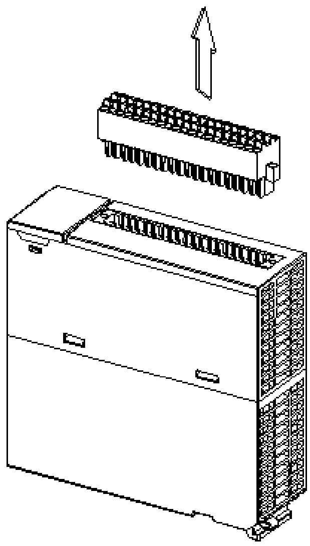


3. Remove the terminal block.

- **Type I**

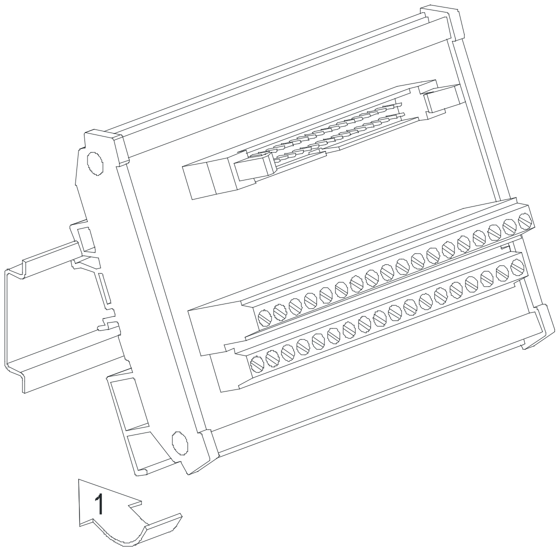


- **Type II**

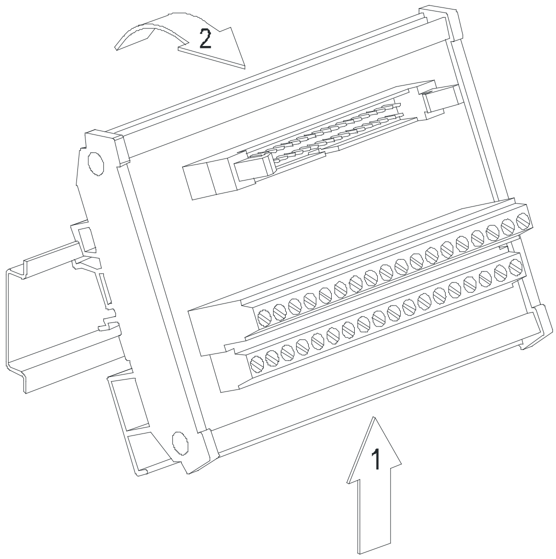


4.3.6 Installing a Wiring Module

- **Installation**
  1. One side of a wiring module has to be fixed first.
  2. Press the driver board in the direction indicated by arrow 1, and make sure that the groove is combined with the DIN rail.



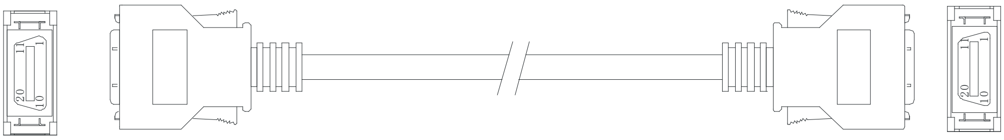
- **Removal**
  1. Push the wiring module in the direction indicated by arrow 1.
  2. Pull the wiring module in the direction indicated by arrow 2.



4.3.7 Connecting Backplanes

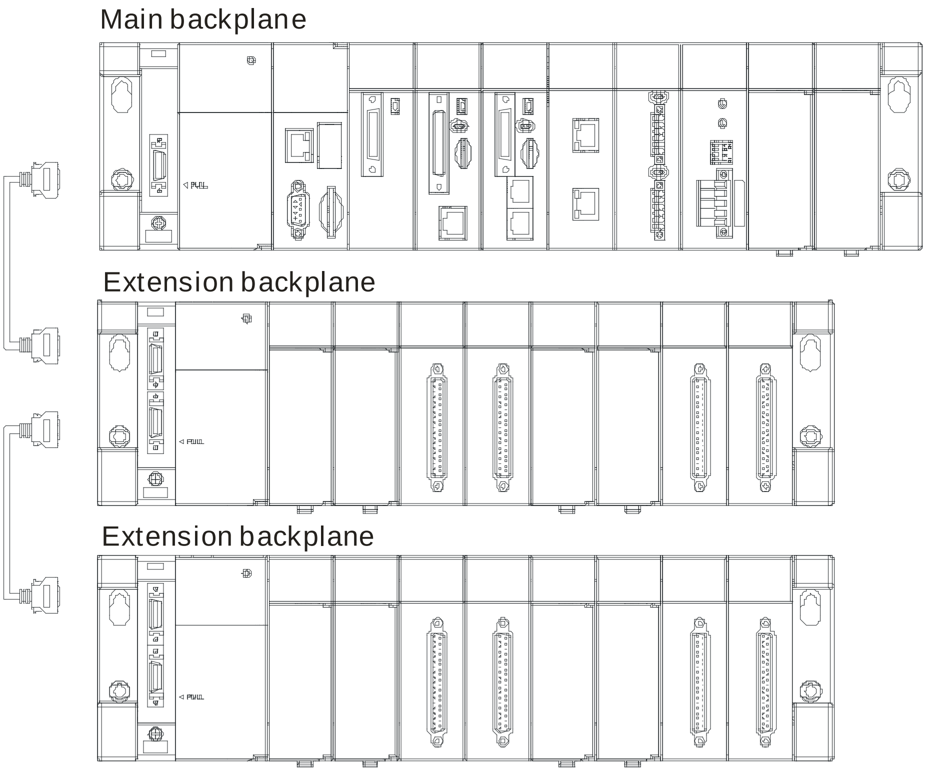
Connect the backplanes through the extension cables, and make sure that the connectors of the cables are joined to the ports properly, as illustrated below.

- Extension cable
  1. AHACAB06-5 A (0.6 m)
  2. AHACAB10-5 A (1.0 m)
  3. AHACAB15-5 A (1.5 m)
  4. AHACAB30-5 A (3.0 m)

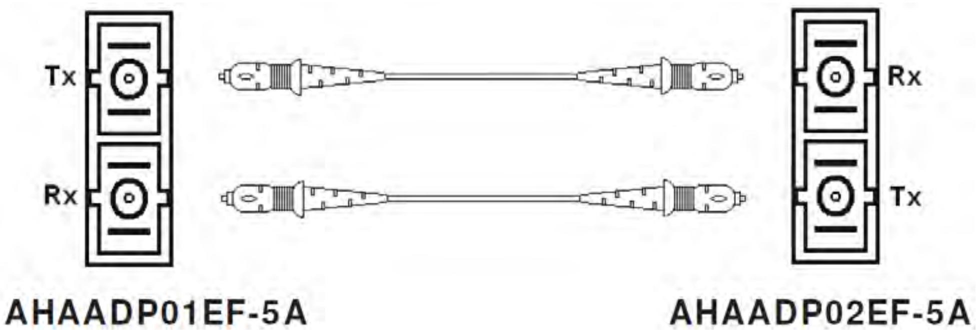


Note: The extension cable longer than 3 meters can be customized.

- Connecting the backplanes

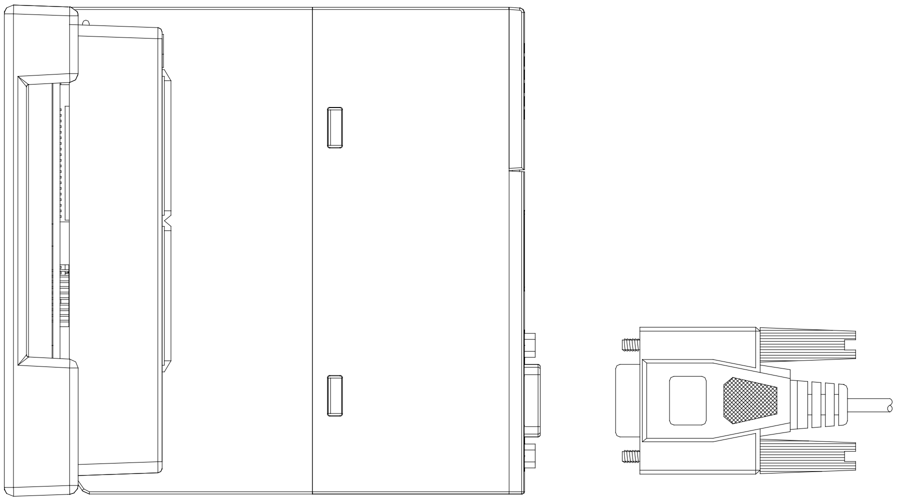


- Fiber optics modules for extension backplanes: AHAADP01EF-5A and AHAADP02EF-5A



4.3.8 Connecting a Communication Cable

Put a communication cable in the port on a CPU module, and make sure that the connector of the cable is joined to the port properly.



4.4 Wiring

- **Points for attention**

DANGER	● Before installing or wiring a module, users need to make sure that the external power supply is turned off. If the power supply is not turned off, users may get an electric shock, or the product may be damaged. ● If the installation of the module or the wiring of the module is complete, users need to make sure that a terminal block cover is installed on the module before they turn on the power supply or operate the module. If the terminal block cover is not installed properly, users may get an electric shock, or the module may not operate normally.
WARNING	● Be sure to connect the terminals FG and LG with protective grounding conductors. Otherwise, users may get an electric shock, or the module may not operate normally. ● To ensure that a PLC is wired correctly, users need to check the rated voltage of the product, and the arrangement of the terminals. If the PLC is connected to the power supply which does not conform to the rated voltage, or the product is not wired correctly, a fire accident will occur, or the product will be damaged. ● The external connections should be crimped or press-welded by specific tools, or soldered correctly. The improper connections will result in a short circuit, a fire accident, or erroneous operation. ● Tighten the terminal screws with the specified torque. If the terminal screws are loose, a short circuit, a fire accident, or erroneous operation will occur. Tightening the terminal screws too far, may cause damage to the terminal screws and the module, resulting in a short circuit or a malfunction. ● Make sure that there are no foreign substances such as iron filings or wiring debris inside the module. Theses foreign substances may result in a fire accident, damage, or erroneous operation.

- **Wiring an I/O module**

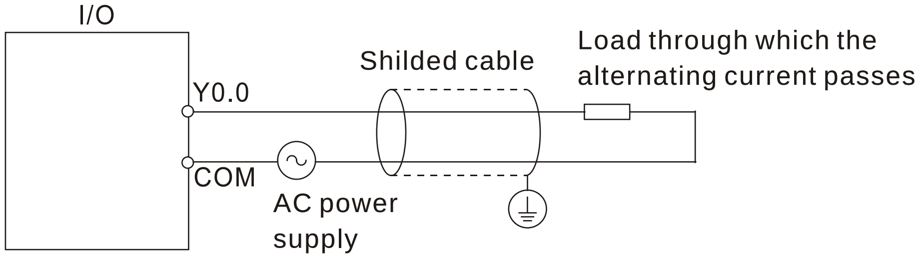
(1) Definitions of the terminals
- 2-/3-wire (passive sensor): the sensor and the system share the same power circuit.
- 4-wire (active sensor): the sensor uses independent power supply and suggested not to share the same power circuit with the system.

(2) Terminals with insulation sleeves can not be arranged as a terminal block. It is recommended that the terminals be covered with insulation tubes.

(3) Please use single-core cables or twin-core cables. The diameters of the cables used should be in the range of 12 AWG to 22 AWG. The torques applied to the screw terminals should be in the range of 5 kg-cm (4.3 Ib-in) to 8 kg-cm (6.9 Ib-in). Please use copper conducting wires. The temperature of the copper conducting wires should be 60/75°C.

(4) Please keep the input cables, the output cables, and the power cable separate form one another.

(5) If the main circuit and the power cable can not be separated from each other, please use a shielded cable, and ground it at the side of the I/O module. In some cases, the shielded cable is grounded at the opposite side.



(6) If users wire a module by means of piping, they need to ground the piping correctly.

(7) Please keep 24 VDC input cables separate from 110 VAC input cables and 220 VDC input cables.

(8) If the wiring length is more than 200 meters (686.67 inches), the leakage current will result from parasitic capacitance, and the system will break down.

- **Grounding a cable**

  Please ground a cable according to the steps below.

  (1) Please ground a cable correctly.

  (2) The area of the cross-section of the cable which is grounded should be 2 mm^2 or larger than 2 mm^2.

  (3) The ground point should be near the PLC. Ground the cable properly.

Note

(1) The 110 V/220 V power cable and the 24 VDC power cable should be thick cables. (The area of the cross-section of the cable is 2 mm^2, and the diameter of the cable is 14 AWG.) Be sure to twist the power cables at terminal screws. To prevent the short circuit which results from loose screws, users need to use solderless terminals with insulation sleeves.

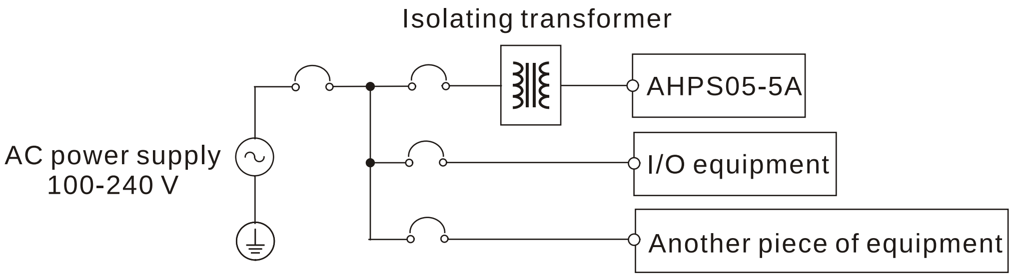
(2) If cables are connected to the terminals LG and FG, the cables need to be grounded. Do not connect LG and FG to any devices. If LG and FG are not grounded, the PLC will be susceptible to noise. Since LG have potential, users will get an electric shock if they touch metal parts.

4.5 Connecting Power Cables

4.5.1 Precautions

- **Connecting AC power cables**

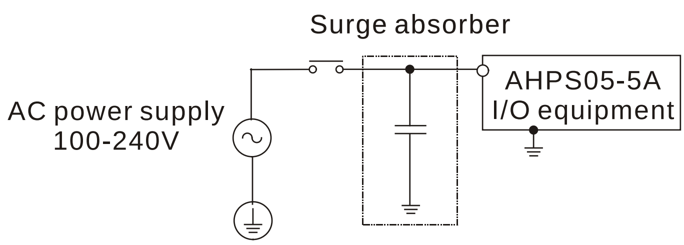
  (1) Please separate the power cable of AHPS05-5A from the power cables for I/O devices and other devices. If there is much noise, connect an isolating transformer.



  (2) The cables carrying the 110 VAC, 220 VAC, and 24 VDC should be single or two-wire cables.

  (3) Do not bundle 110 VAC cable, the 220 VAC cable, the 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. Besides, it is recommended that the distance between adjacent cables should be more than 100 millimeters.

  (4) To prevent the surge resulting from lightning, please install a surge absorber in the way shown below.

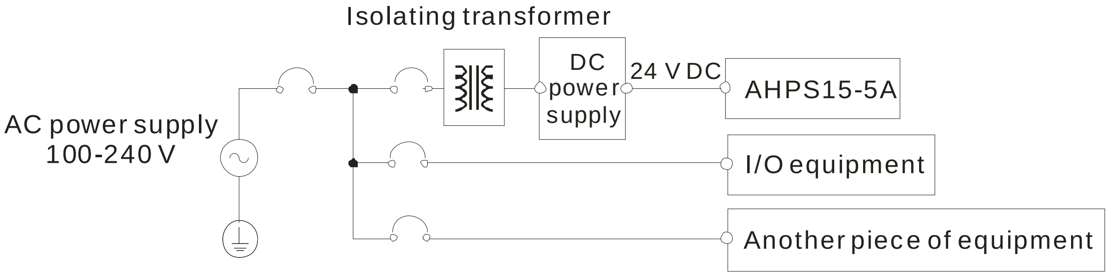


Points for attention:

1. The surge absorber and the PLC system should be grounded separately.
2. Please select the surge absorber whose working voltage is not less than the maximum allowable input voltage.

- **Connecting DC power cables**

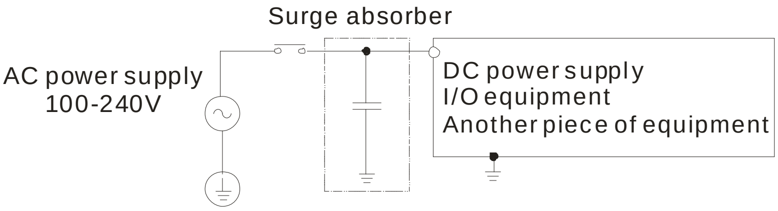
(1) AHPS15-5A is independently supplied with power by a DC power supply. Please separate the power cable of the DC power supply from the power cables for I/O devices and other devices. If there is much noise, connect an isolating transformer.



(2) The 110 VAC cable, the 220 VAC cable, and the 24 VDC cable should be twisted, and connected to a module within a short distance.

(3) Do not bundle 110 VAC cable, the 220 VAC cable, the 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. Besides, it is recommended that the distance between adjacent cables should be more than 100 millimeters.

(4) To prevent the surge resulting from lightning, please install a surge absorber in the way shown below.

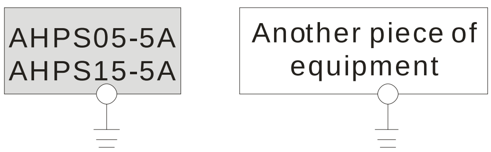


Points for attention:

1. The surge absorber and the PLC system should be grounded separately.
2. Please select the surge absorber whose working voltage is not less than the maximum allowable input voltage.

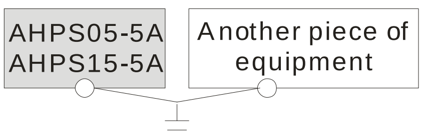
4.5.2 Ground

- The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.
- If much equipment is used, please use single-point ground.



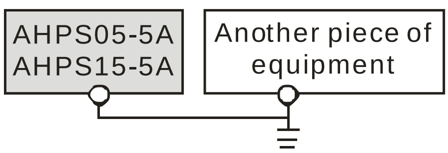
The single-point ground is better.

- If single-point ground can not be used, please use common-point ground.



The common-point ground is permitted.

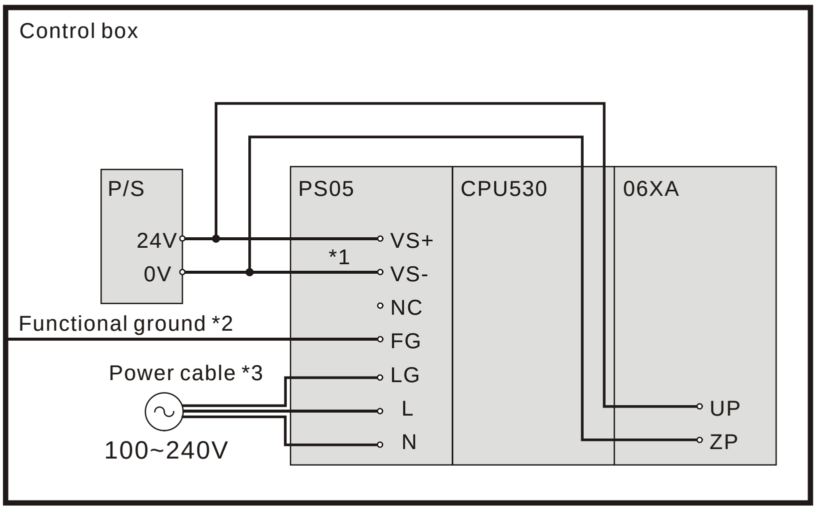
- Users can not ground equipment in the way shown on the right.



The equipment can not be grounded in this way.

4.5.3 Wiring Power Supply Modules

- **Connecting an AC power cable**

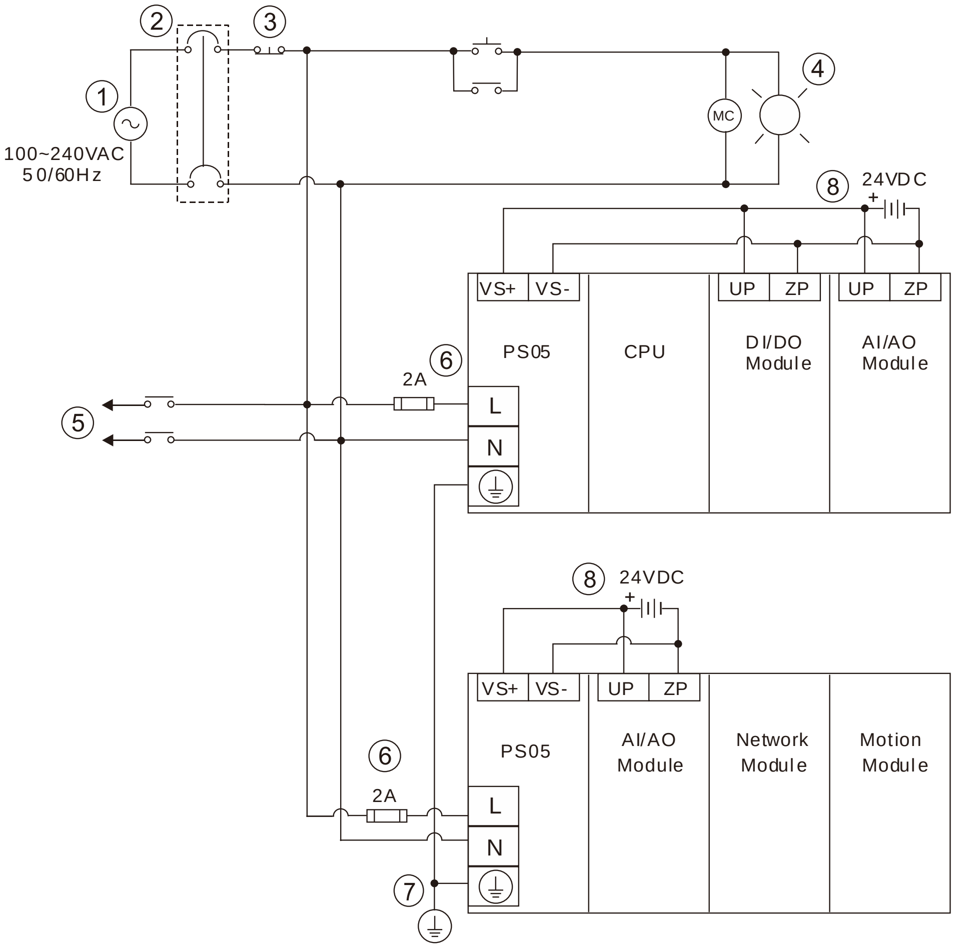


*1. 24V on the external power supply is connected to VS+ and VS- on the power supply module. VS+ and VS- can be used to detect whether the voltage of the external power supply is stable.
*2. FG on the power supply module is connected to the control box as the functional ground.
*3. The live wire and the neutral wire in the AC power cable are connected to L and N on the power supply module respectively. To prevent the system from becoming abnormal, the ground in the AC power cable has to be connected to LG on the power supply module.

The power input of AHPS05-5A is the AC input. Users have to pay attention to the following points when they use AHPS05-5A.

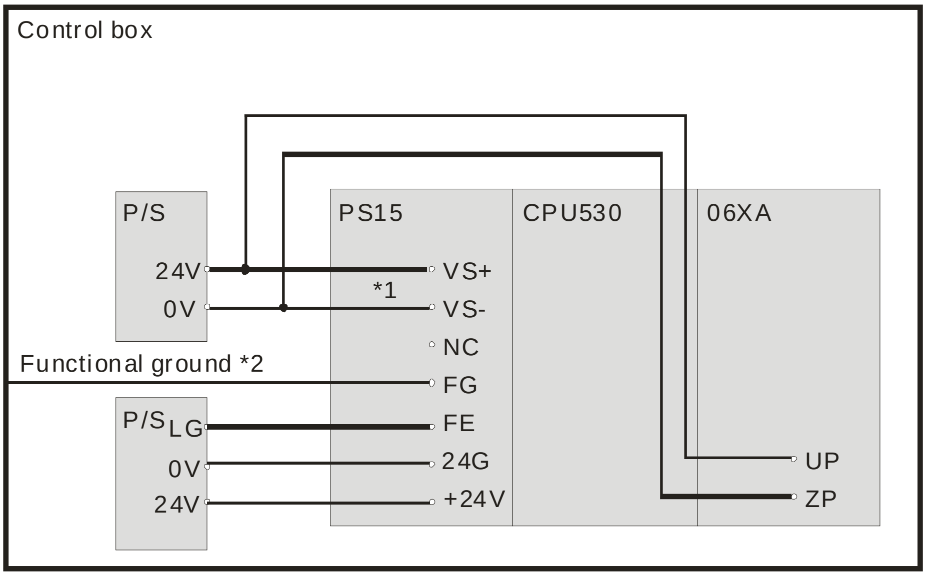
- The alternating-current input voltage is in the range of 100 VAC to 240 VAC. Please connect the power supply to the terminals L and N. If the 110 VAC or the 220 VAC power supply is connected to the input terminals VS+ and VS-, the PLC will be damaged.
- In order to ensure that the external power supply stably provides24 VDC power, the external power supply can be connected to VS+ and VS-. If the PLC detects that the voltage of the external power supply is lower than the working voltage, users can write a protective program.
- The length of the cable connecting with the ground should be more than 1.6 millimeters.
- If the power cut lasts for less than 10 milliseconds, the PLC keeps running without being affected. If the power cut lasts for long, or if the voltage of the power supply decreases, the PLC stops running, and there is no output. When the power supply returns to normal, the PLC resumes. (Users have to notice that there are latched auxiliary relays and registers in the PLC when they write the program.)
- Please use single-core cables or multicore cables. The diameters of the cables used should be in the range of 12 AWG to 22 AWG. The torque applied to the terminal screws should be 9.50 kg-cm (8.25 Ib-in). Please use copper conducting wires. The temperature of the copper conductive cables should be 60/75°C.

- Safety wiring: The PLC controls many devices, and the activity of any device affects the activity of other devices. If any device breaks down, the whole automatic control system goes out of control, and the danger occurs. The protection circuit is shown below.



①	Alternating-current power supply: 100~240 VAC, and 50/60 Hz
②	Circuit breaker
③	Emergency stop: The emergency stop button can be used to cut off the power when an emergency occurs.
④	Power indicator
⑤	Load through which the alternating current passes
⑥	2 A fuse
⑦	The ground impedance is less than 100 Ω.
⑧	Direct-current power supply: 24 VDC

- **Connecting a DC power cable**



*1. 24V on the external power supply is connected to VS+ and VS- on the power supply module. VS+ and VS- can be used to detect whether the voltage of the external power supply is stable.
*2. FG on the power supply module is connected to the control box as the functional ground.
*3. +24V and 24G on the power supply module are connected to 24V and 0V on the DC power supply. To prevent the system from becoming abnormal, the ground of the DC power supply has to be connected to FE on the power supply module.

The power input of AHPS15-5A is the DC input. Users have to pay attention to the following points when they use AHPS15-5A.

- In order to ensure that the external power supply stably provides 24 VDC power, the external power supply can be connected to VS+ and VS-. If the PLC detects that the voltage of the external power supply is lower than the working voltage, users can write a protective program.
- The length of the cable connecting with the ground should be more than 1.6 millimeters.
- If the power cut lasts for less than 10 milliseconds, the PLC keeps running without being affected. If the power cut lasts for long, or if the voltage of the power supply decreases, the PLC stops running, and there is no output. When the power supply returns to normal, the PLC resumes. (Users have to notice that there are latched auxiliary relays and registers in the PLC when they write the program.)
- Please use single-core cables or multicore cables. The diameters of the cables used should be in the range of 12 AWG to 22 AWG. The torque applied to the terminal screws should be 9.50 kg-cm (8.25 Ib-in). Please use copper conducting wires. The temperature of the copper conductive cables should be 60/75°C.

4.5.4 Power Consumption

Classification	Model name	Internal power consumption	External power consumption
CPU module	AHCPU500-RS2	2W	-
	AHCPU501-RS2	2.9W	-
	AHCPU510-RS2	2W	-
	AHCPU511-RS2	2.9W	-
	AHCPU520-RS2	2W	-
	AHCPU521-RS2	2.9W	-
	AHCPU530-RS2	2W	-
	AHCPU531-RS2	2.9W	-
	AHCPU500-EN	2W	-
	AHCPU501-EN	2.9W	-
	AHCPU510-EN	2W	-
	AHCPU511-EN	2.9W	-
	AHCPU520-EN	2W	-
	AHCPU521-EN	2.9W	
	AHCPU530-EN	2W	-
	AHCPU531-EN	2.9W	-
	AHCPU521-DNP	2.9W	-
	AHCPU560-EN2	4.5W	-
Main backplane	AHBP04M1-5A	10mW	-
	AHBP06M1-5A	10mW	-
	AHBP08M1-5A	10mW	-
	AHBP12M1-5A	10mW	-
Extension backplane	AHBP06E1-5A	1.41W	-
	AHBP08E1-5A	1.41W	-
Redundant main backplane	AHBP04MR1-5A	0.2W	-
	AHBP06MR1-5A	0.2W	-
	AHBP08MR1-5A	0.2W	-
Redundant extension backplane	AHBP06ER1-5A	1.1W	-
	AHBP08ER1-5A	1.1W	-
Digital I/O module	AH16AM10N-5A	0.1W	1.9W
	AH16AM30N-5A	0.1W	-
	AH16AN01P-5A	0.2W	0.4W
	AH16AN01R-5A	2.1W	-
	AH16AN01S-5A	0.6W	-

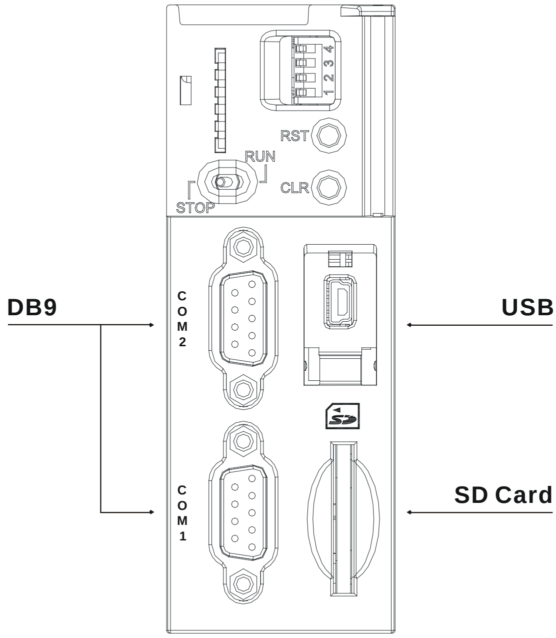
Classification	Model name	Internal power consumption	External power consumption
	AH16AN01T-5A	0.2W	0.4W
	AH16AP11P-5A	0.2W	0.2W
	AH16AP11R-5A	1.1W	-
	AH16AP11T-5A	0.2W	0.2W
	AH16AR10N-5A	0.5W	1.9W
	AH32AM10N-5A	0.2W	3.8W
	AH32AM10N-5B	0.2W	3.8W
	AH32AM10N-5C	0.2W	3.8W
	AH32AN02P-5A	0.4W	0.8W
	AH32AN02P-5B	0.4W	0.8W
	AH32AN02P-5C	0.4W	0.8W
	AH32AN02T-5A	0.4W	0.8W
	AH32AN02T-5B	0.4W	0.8W
	AH32AN02T-5C	0.4W	0.8W
	AH64AM10N-5C	0.2W	4.9W
	AH64AN02P-5C	0.6W	1.5W
	AH64AN02T-5C	0.6W	1.5W
Analog I/O module	AH04AD-5A	0.35W	1W
	AH04DA-5A	0.34W	2.6W
	AH06XA-5A	0.34W	1.4W
	AH08AD-5A	1.5W	-
	AH08DA-5A	0.1W	5W
	AH08AD-5B	1.9W	-
	AH08DA-5B	0.25W	2.2W
	AH08AD-5C	1.6W	-
	AH08DA-5C	0.25W	3.7W
Temperature measurement module	AH04PT-5A	2W	-
	AH08PTG-5A	0.7W	4W
	AH04TC-5A	1.5W	-
	AH08TC-5A	1.5W	-
Motion control module	AH02HC-5A	2.4W	-
	AH04HC-5A	2.4W	-
	AH05PM-5A	2.7W	-
	AH10PM-5A	2.7W	-
	AH15PM-5A	2.7W	-
	AH20MC-5A	3W	-

Classification	Model name	Internal power consumption	External power consumption
Network module	AH10EN-5A	1.6W	-
	AH15EN-5A	1.6W	-
	AH10SCM-5A	1.2W	-
	AH15SCM-5A	1W	-
	AH10DNET-5A	0.9W	0.72W
	AH10PFBS-5A	1W	-
	AH10PFBM-5A	2W	-
	AH10COPM-5A	1W	-
Remote I/O module	AHRTU-DNET-5A	0.75W	0.72W
	AHRTU-PFBS-5A	1.9W	-
	AHRTU-ETHN-5A	2.2W	-

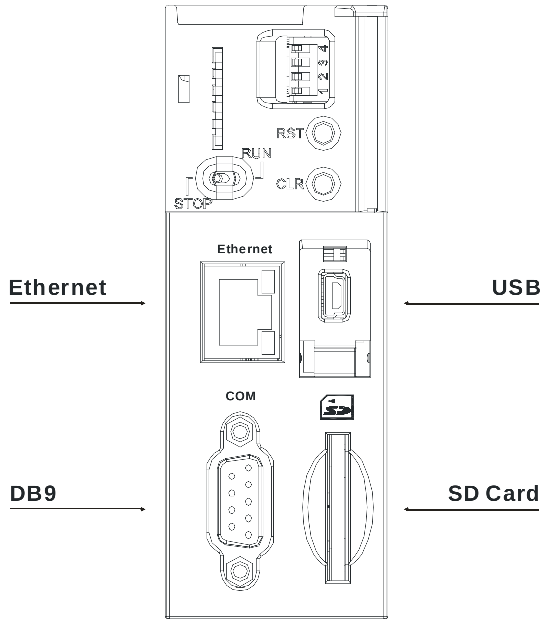
4.6 Wiring CPU Modules

4.6.1 AH500 Basic / Advanced CPU Modules

- **AHCPU5X0/AHCPU5X1-RS2**

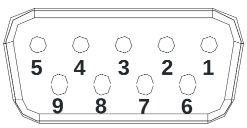


- **AHCPU5X0/AHCPU5X1-EN/ AHCPU521-DNP**



- **DB9 connector**

Pin	Function		
	RS-485	RS-422	RS-232
1	D+	RX+	N/C
2	N/C	N/C	RX
3	N/C	N/C	TX
4	N/C	TX+	N/C
5	Ground	Ground	Ground
6	D-	RX-	N/C
7	N/C	N/C	N/C
8	N/C	N/C	N/C
9	N/C	TX-	N/C

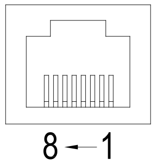


- **USB port**

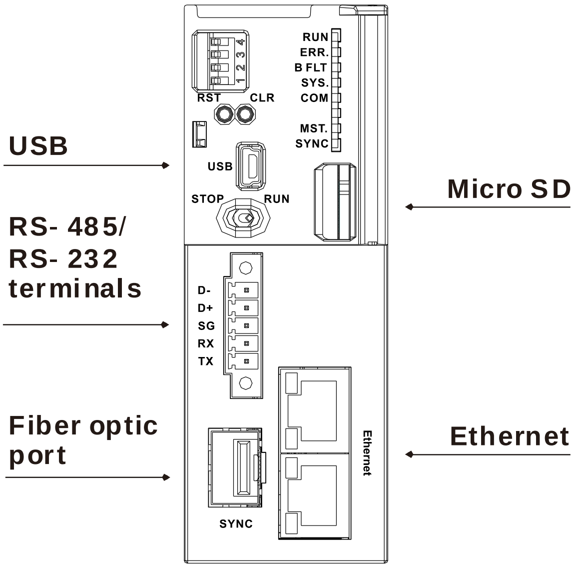
Pin	Function
1	VBUS (4.4–5.25 V)
2	D−
3	D+
4	Ground
5	Ground

- **Ethernet port**

Pin	Signal	Description
1	TX+	Transmitting data (positive pole)
2	TX-	Transmitting data (negative pole)
3	RX+	Receiving data (positive pole)
4	--	N/C
5	--	N/C
6	RX-	Receiving data (negative pole)
7	--	N/C
8	--	N/C

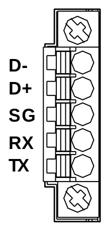


4.6.2 AH500 Redundant CPU Modules



- **RS-485 / RS-232 connector**

Pin	Function	
	RS-485	RS-232
5	D-	N/C
4	D+	N/C
3	SG	SG
2	N/C	RX
1	N/C	TX



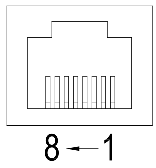
WARNING	Use copper conducting wires in a diameter of 26 AWG~22 AWG and with a temperature rating of 80°C.

- **USB port**

Pin	Function
1	VBUS (4.4–5.25 V)
2	D−
3	D+
4	Ground
5	Ground

- **Ethernet port**

Pin	Signal	Description
1	TX+	Transmitting data (positive pole)
2	TX-	Transmitting data (negative pole)
3	RX+	Receiving data (positive pole)
4	--	N/C
5	--	N/C
6	RX-	Receiving data (negative pole)
7	--	N/C
8	--	N/C

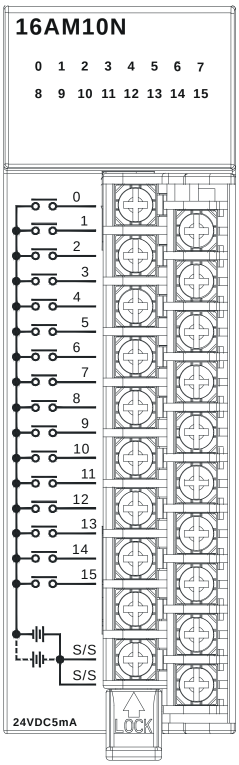


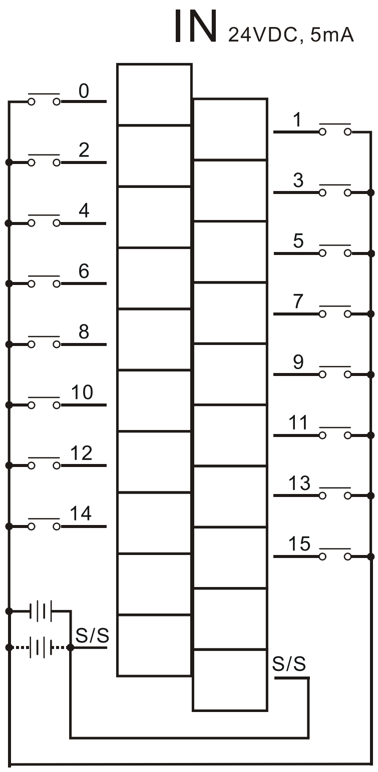
4.7 Wiring Digital Input/Output Modules

The wiring of digital input/output modules is illustrated simply in this section. The simplistic wiring diagrams below also illustrate how the power supplies are connected to S/S, UP, ZP and COM. If users want to get more information about the wiring of digital input/output terminals, they can refer to section 4.8 in this manual.

4.7.1 Wiring AH16AM10N-5A

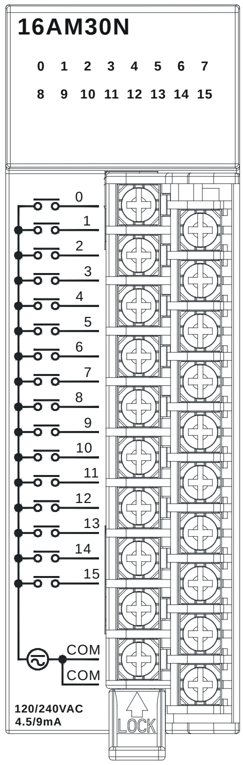
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA

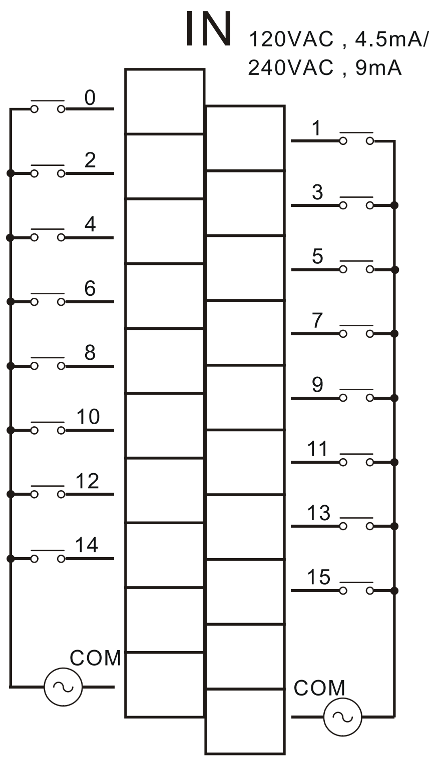




4.7.2 Wiring AH16AM30N-5A

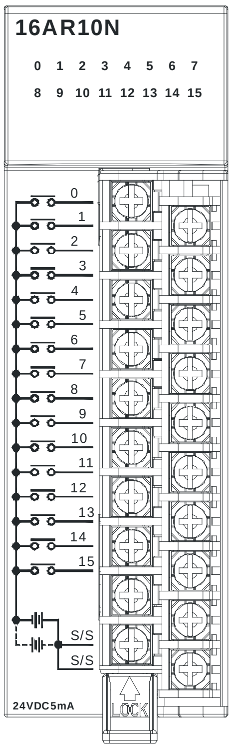
Input form	Alternating current
Input current	120 VAC, 4.5 mA; 240 VAC, 9 mA

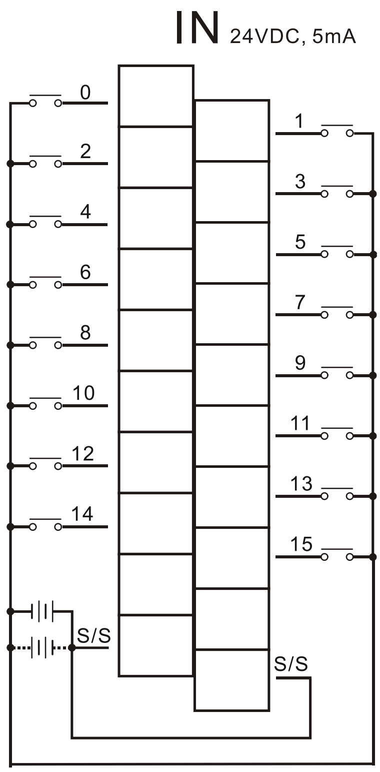




4.7.3 Wiring AH16AR10N-5A

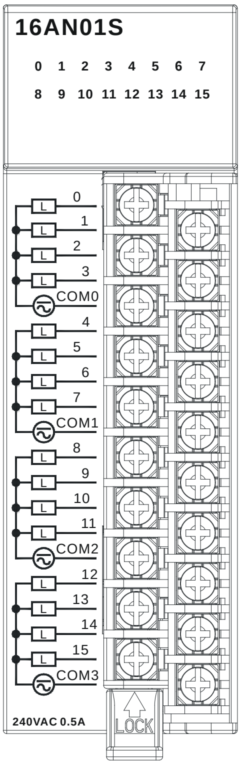
Input form	Direct current (sinking or sourcing)
Input current	240 VDC, 5 mA

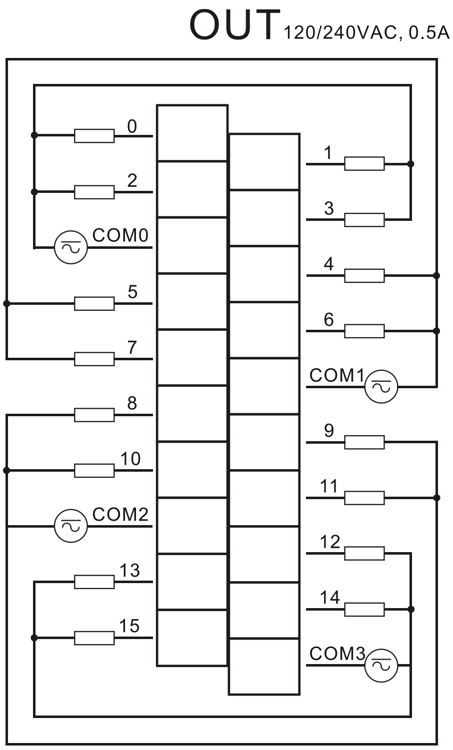




4.7.4 Wiring AH16AN01S-5A

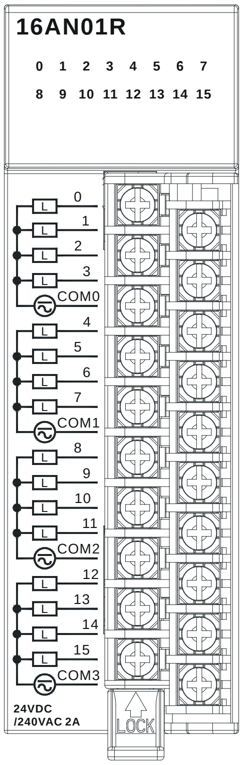
Output type	TRIAC-S
Voltage specifications	120/240 VAC, 0.5 A

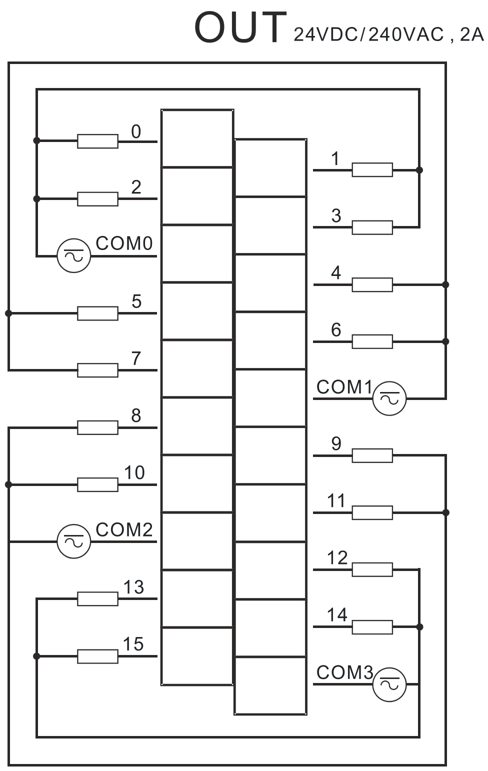




4.7.5 Wiring AH16AN01R-5A

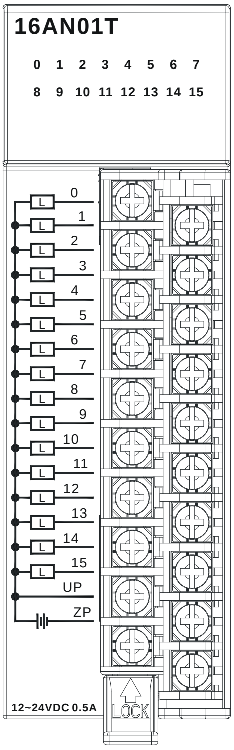
Output type	Relay-R
Voltage specifications	24 VDC, 240 VAC, 2 A

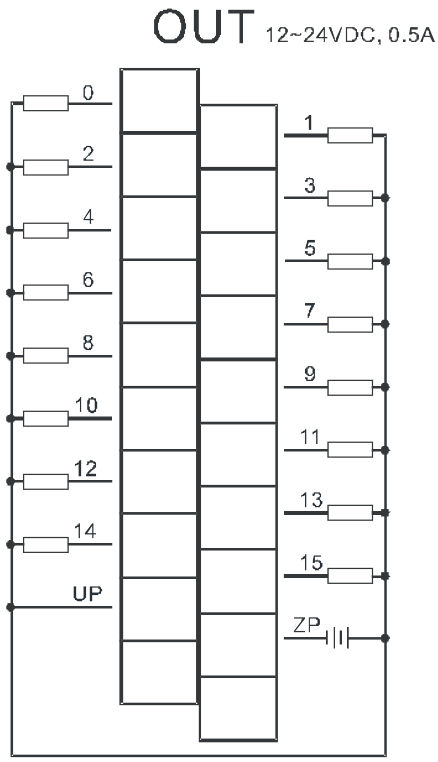




4.7.6 Wiring AH16AN01T-5A

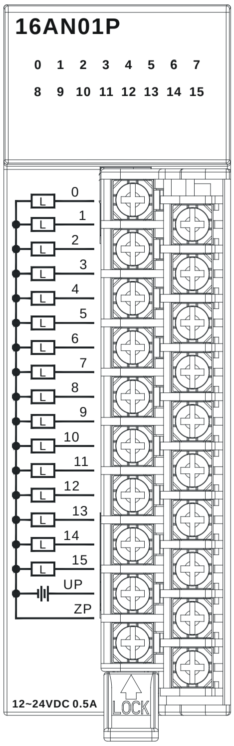
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.5 A

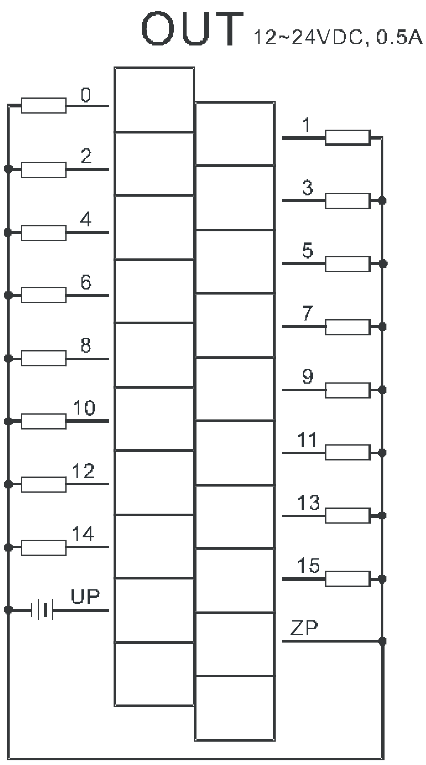




4.7.7 Wiring AH16AN01P-5A

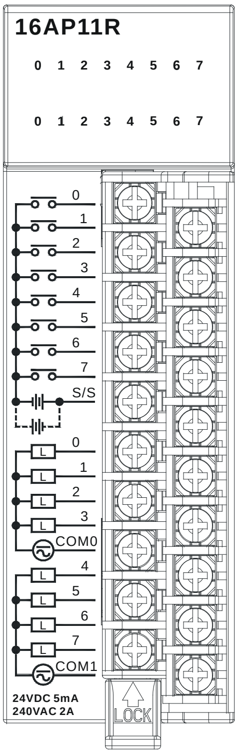
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.5 A

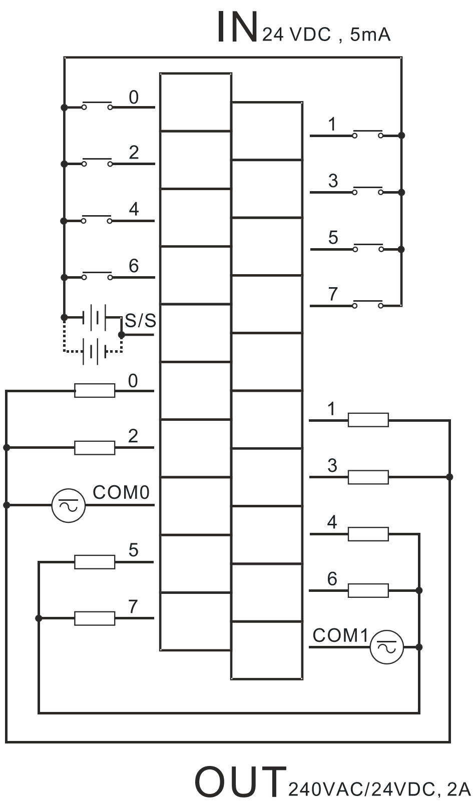




4.7.8 Wiring AH16AP11R-5A

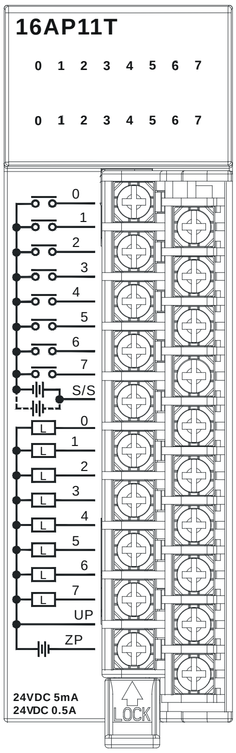
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA
Output type	Relay-R
Voltage specifications	24 VDC, 240 VAC, 2 A

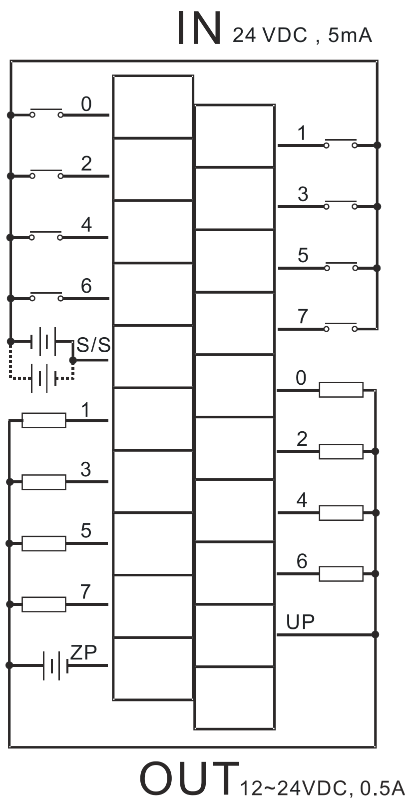




4.7.9 Wiring AH16AP11T-5A

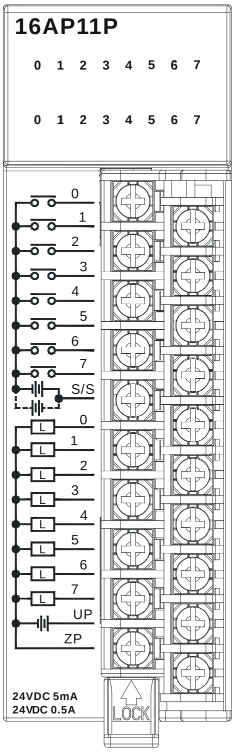
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.5 A

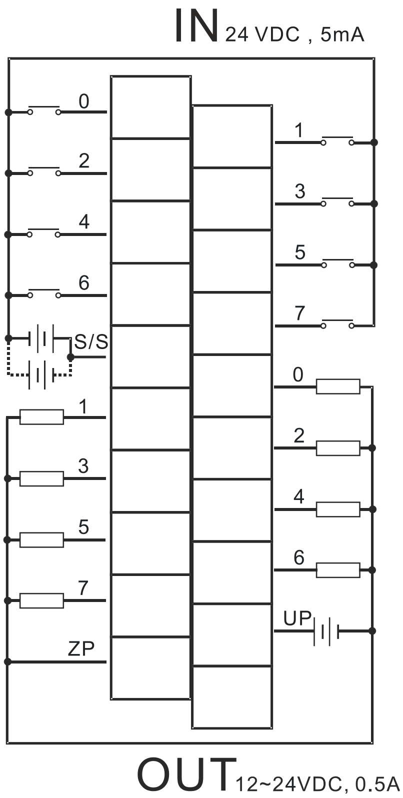




4.7.10 Wiring AH16AP11P-5A

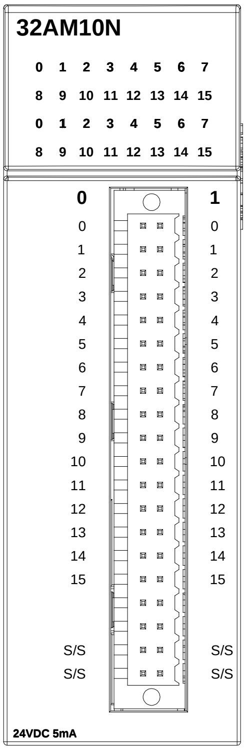
Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.5 A

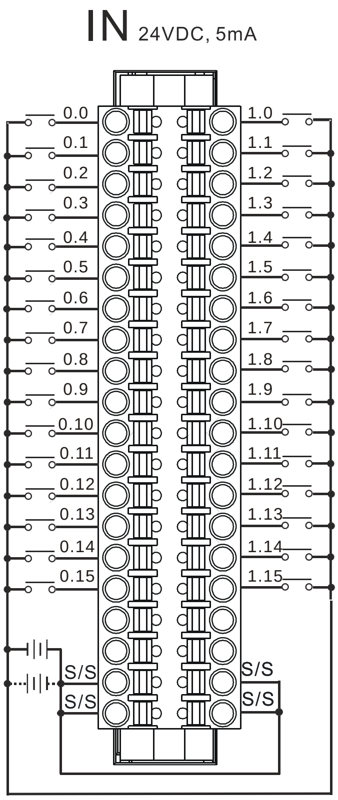




4.7.11 Wiring AH32AM10N-5A

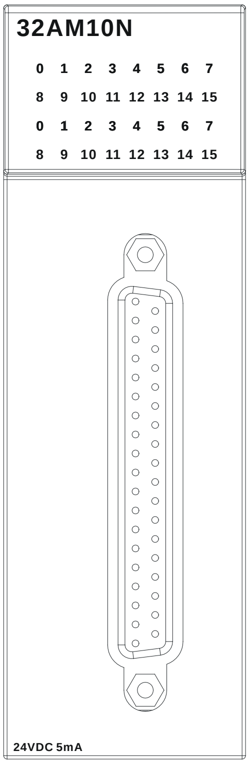
Input form	Direct current (sinking or sourcing)
Input current	240 VDC, 5 mA

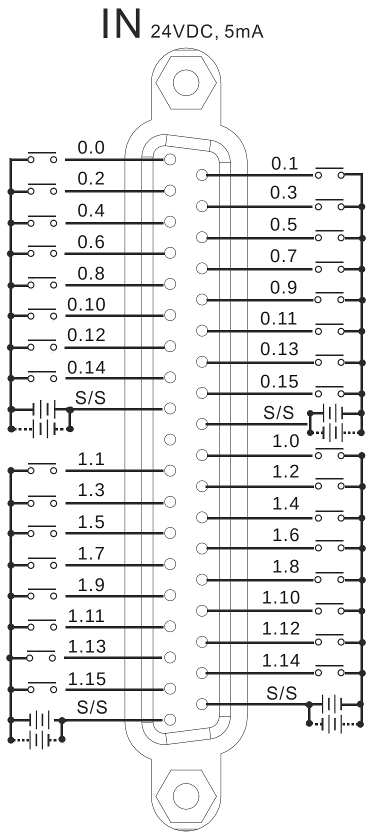




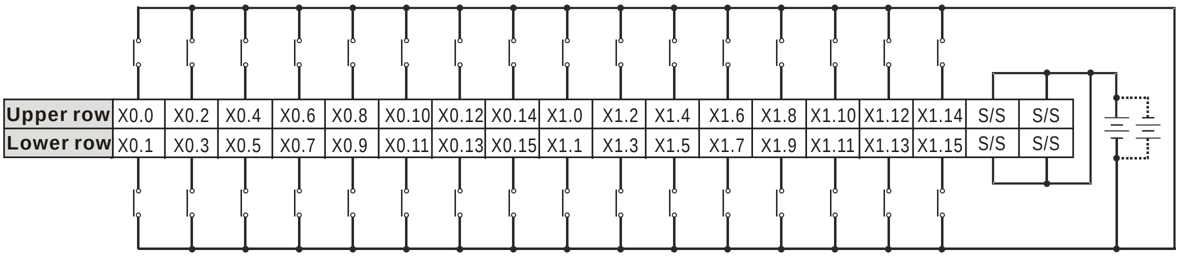
4.7.12 Wiring AH32AM10N-5B

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA





Wiring the external terminal module UB-10-ID32B:

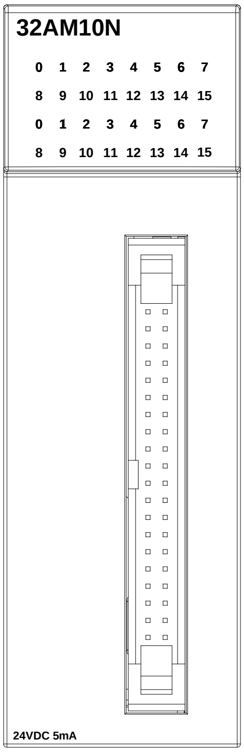


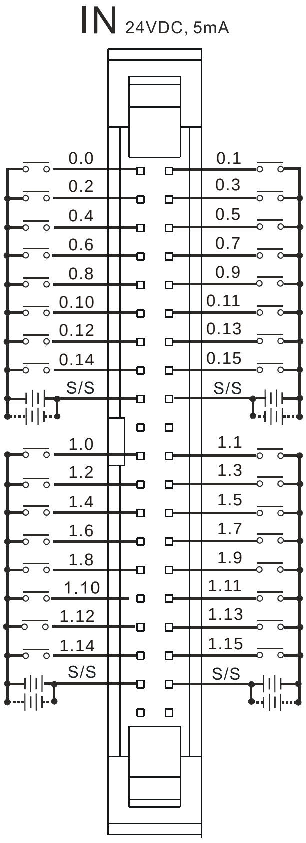
Upper row	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	X1.0	X1.2	X1.4	X1.6	X1.8	X1.10	X1.12	X1.14	S/S	S/S
Lower row	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	X1.1	X1.3	X1.5	X1.7	X1.9	X1.11	X1.13	X1.15	S/S	S/S

24 V DC, 5 mA

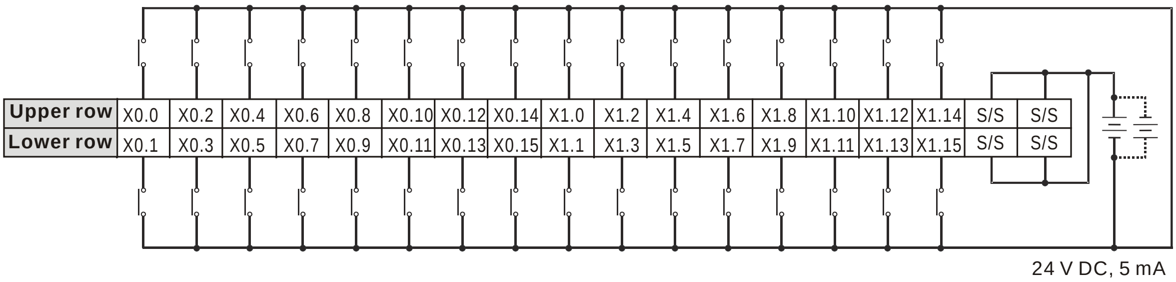
4.7.13 Wiring AH32AM10N-5C

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



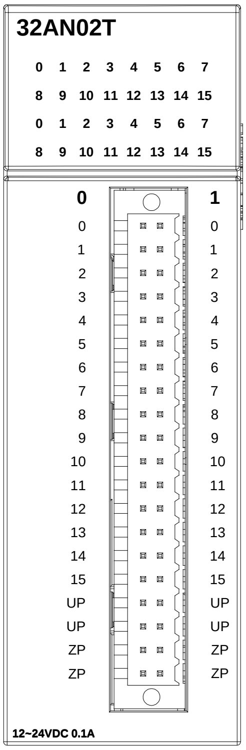


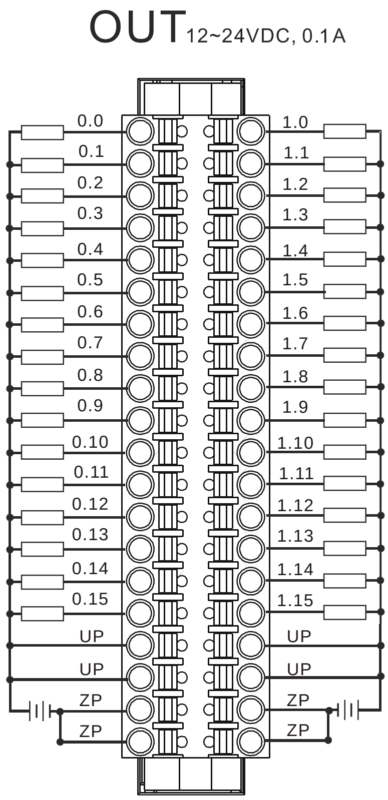
Wiring the external terminal module UB-10-ID32A:



4.7.14 Wiring AH32AN02T-5A

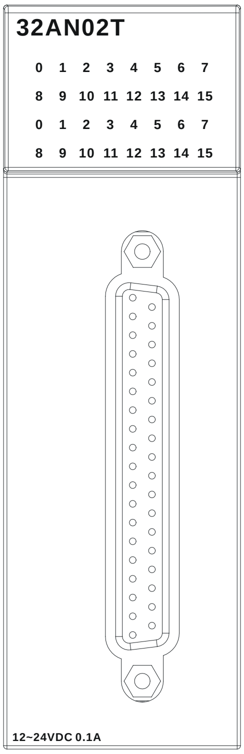
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A

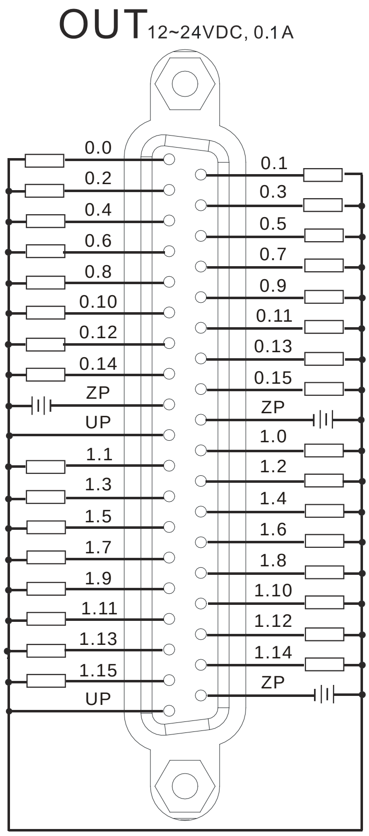




4.7.15 Wiring AH32AN02T-5B

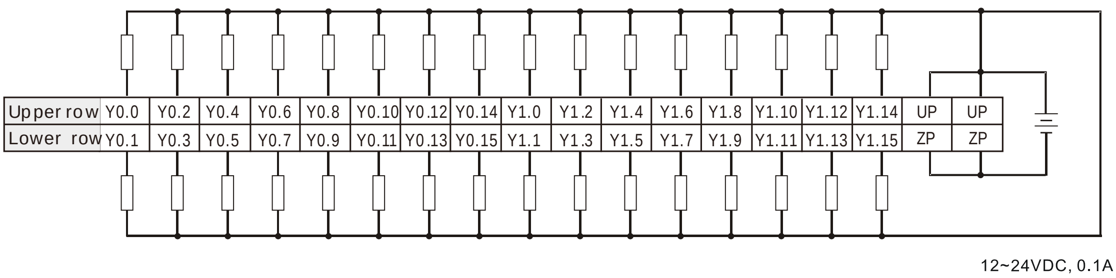
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A





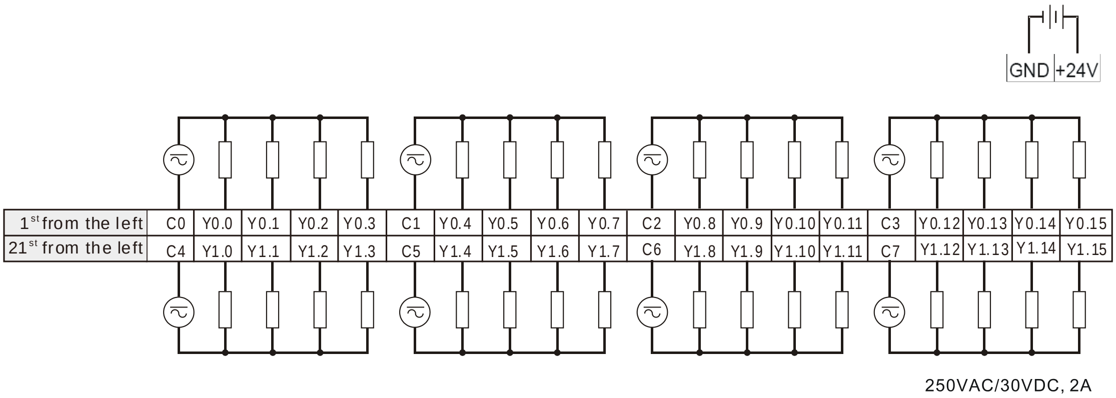
Wiring the external terminal module UB-10-OT32B:

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



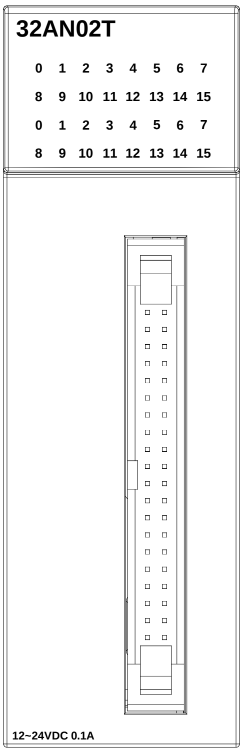
Wiring the external terminal module UB-10-OR32A:

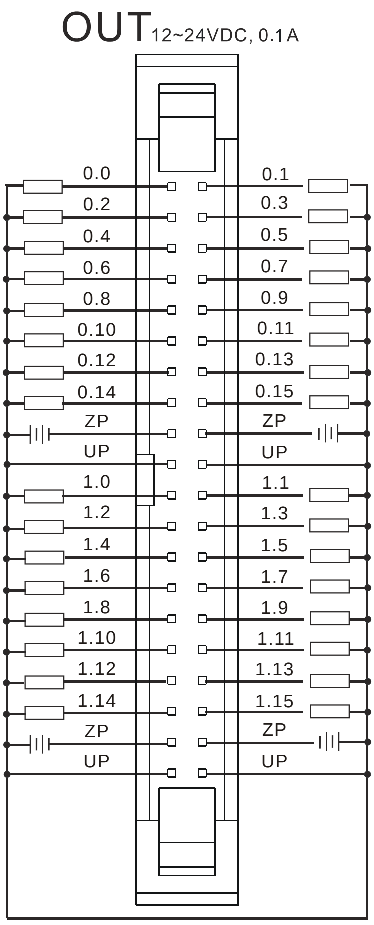
Output type	Relay-R
Voltage specifications	250 VAC, below 30 VDC



4.7.16 Wiring AH32AN02T-5C

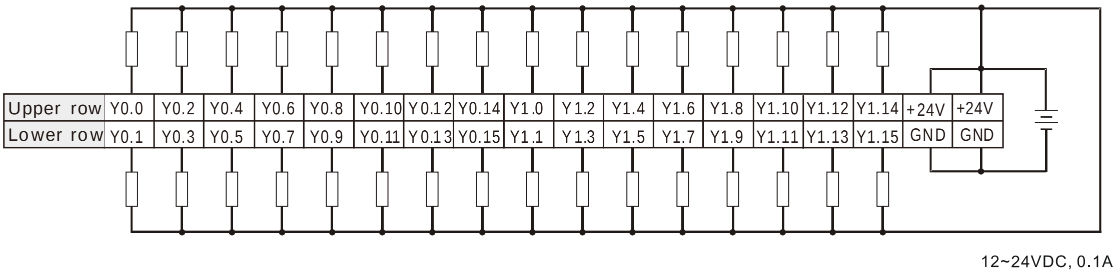
Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A





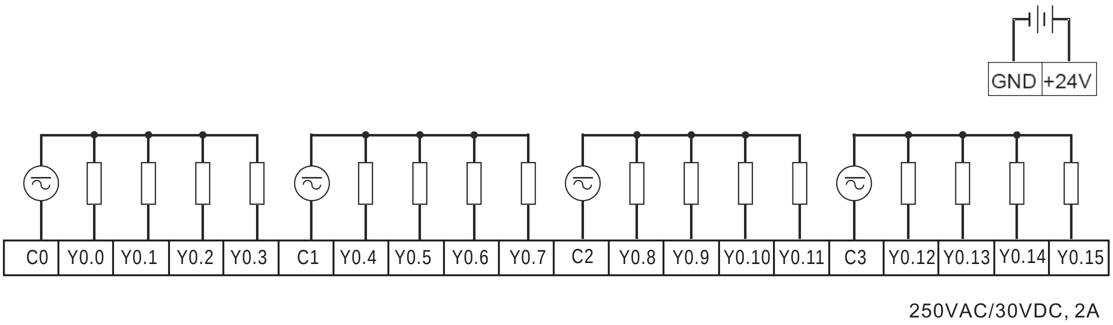
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



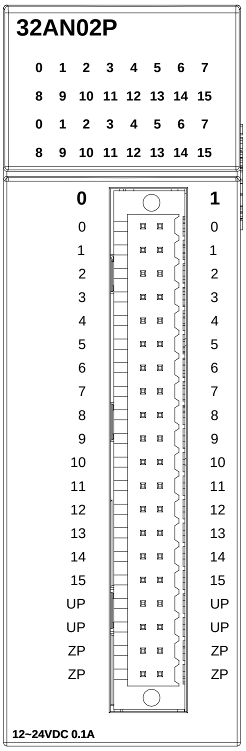
Wiring the external terminal module UB-10-OR16A:

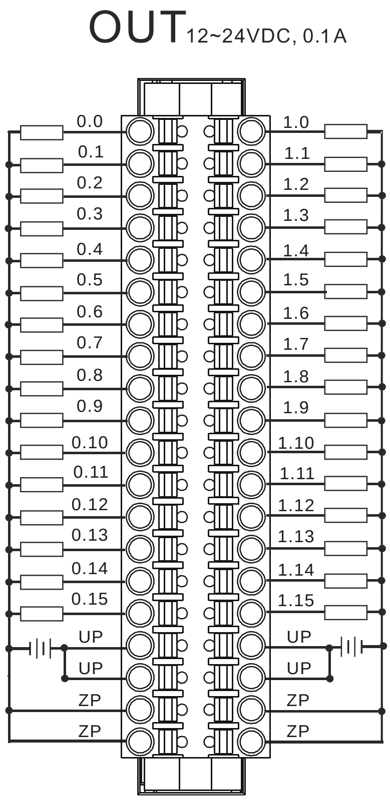
Output type	Relay-R
Voltage specifications	250 VAC, below 30 VDC



4.7.17 Wiring AH32AN02P-5A

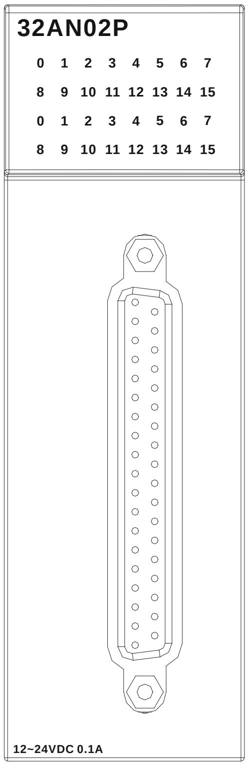
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A

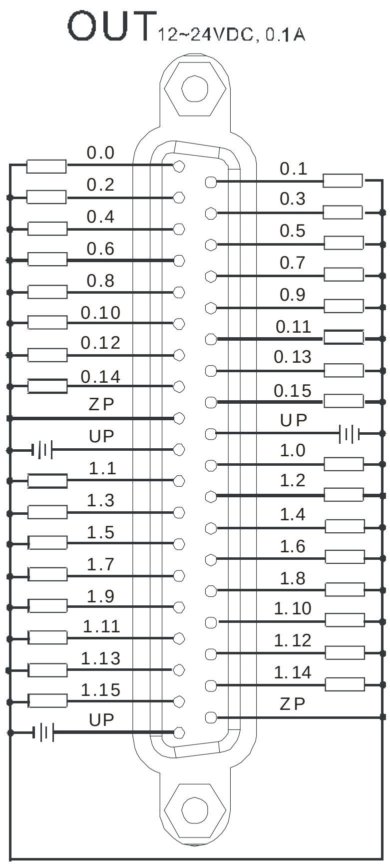




4.7.18 Wiring AH32AN02P-5B

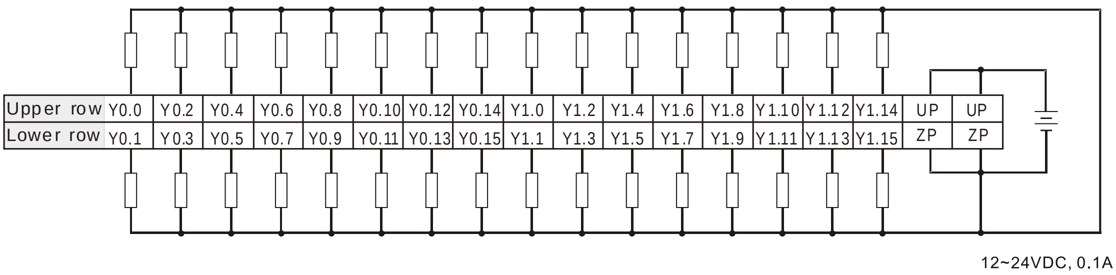
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A





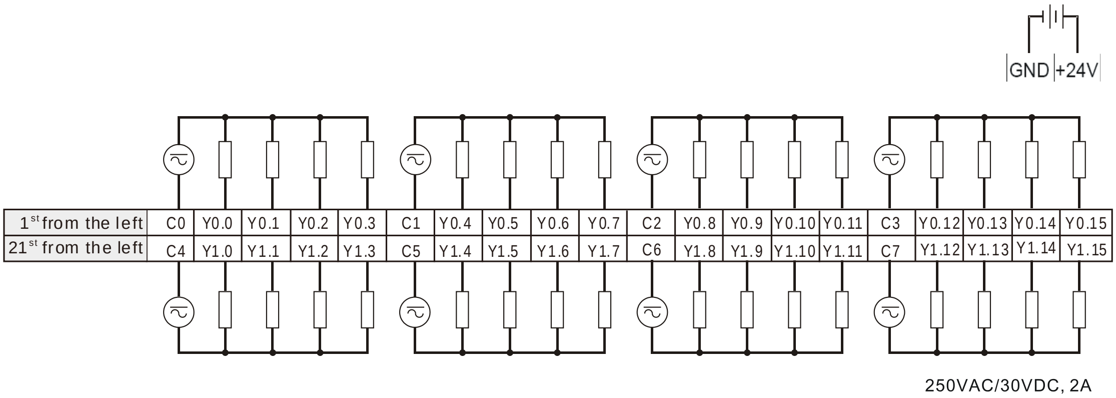
Wiring the external terminal module UB-10-OT32B:

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



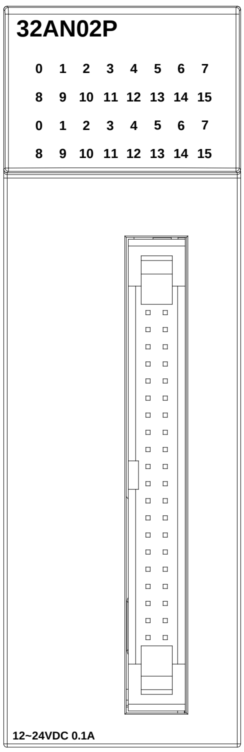
Wiring the external terminal module UB-10-OR32B:

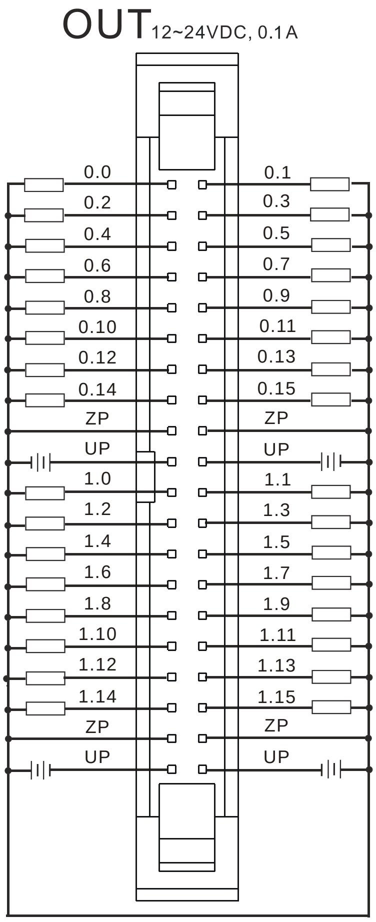
Output type	Relay-R
Voltage specifications	250 VAC, below 30 VDC



4.7.19 Wiring AH32AN02P-5C

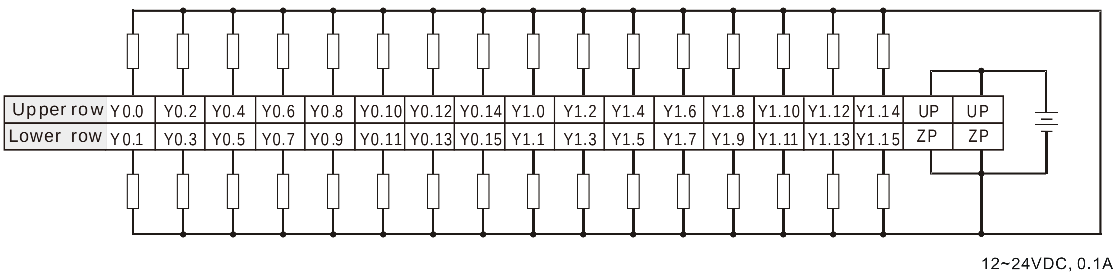
Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A





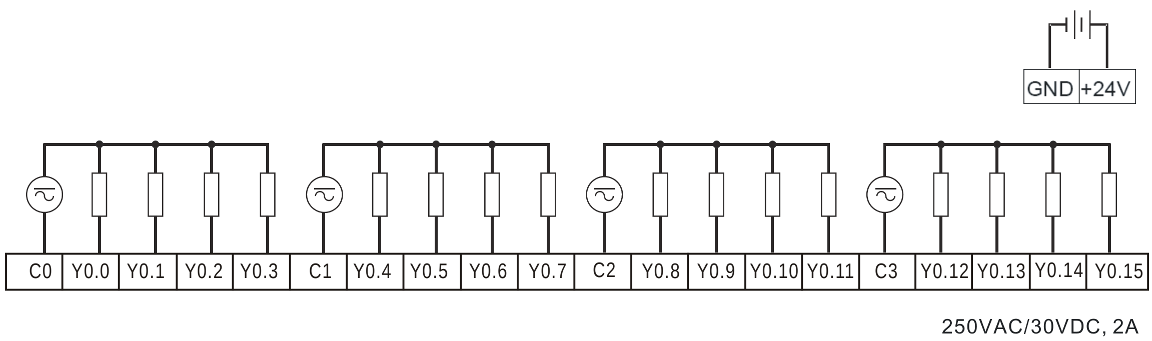
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



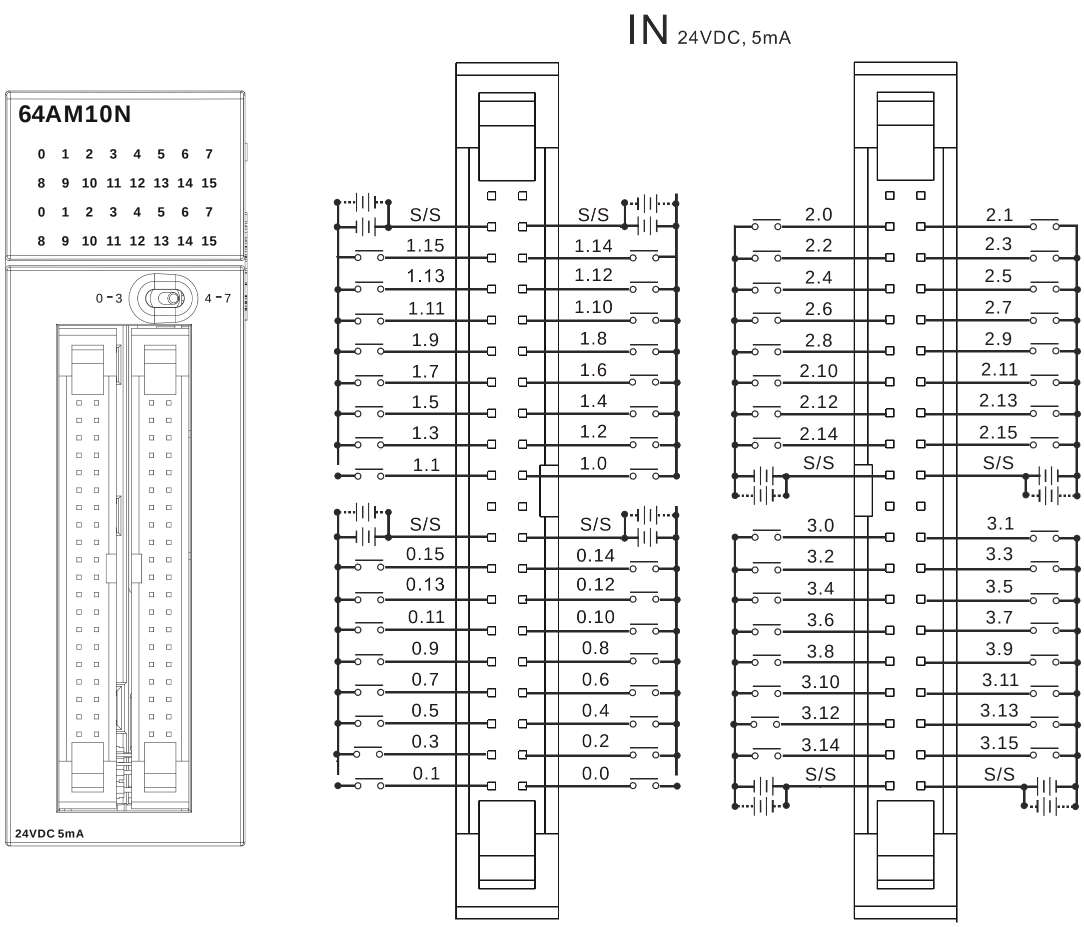
Wiring the external terminal module UB-10-OR16B:

Output type	Relay-R
Voltage specifications	250 VAC, below 30 VDC



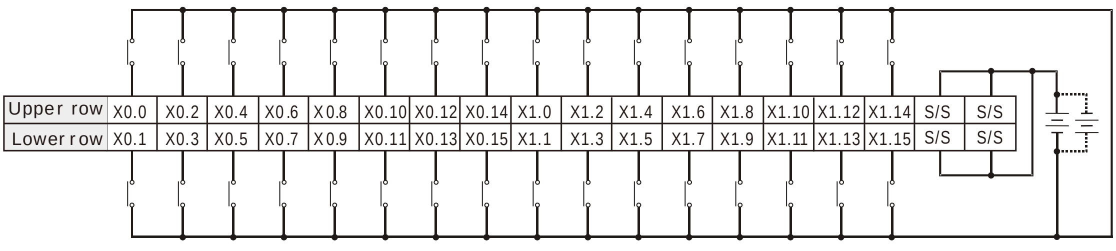
4.7.20 Wiring AH64AM10N-5C

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



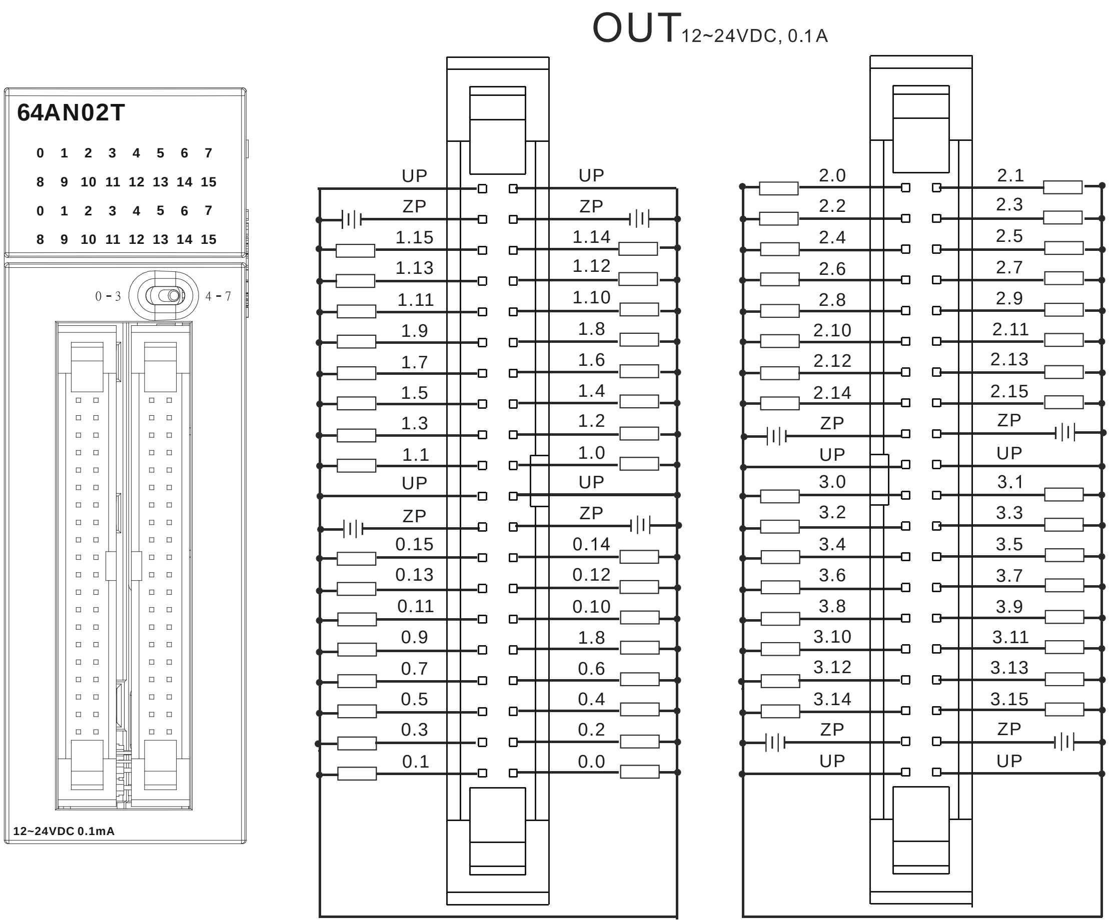
Wiring the external terminal module UB-10-ID32A:

Input form	Direct current (sinking or sourcing)
Input current	24 VDC, 5 mA



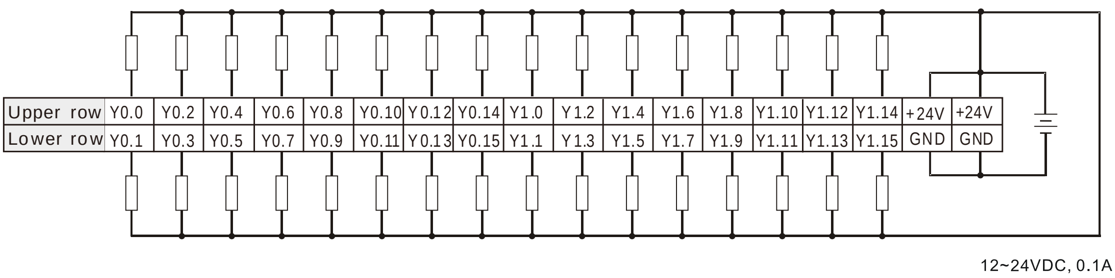
4.7.21 Wiring AH64AN02T-5C

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



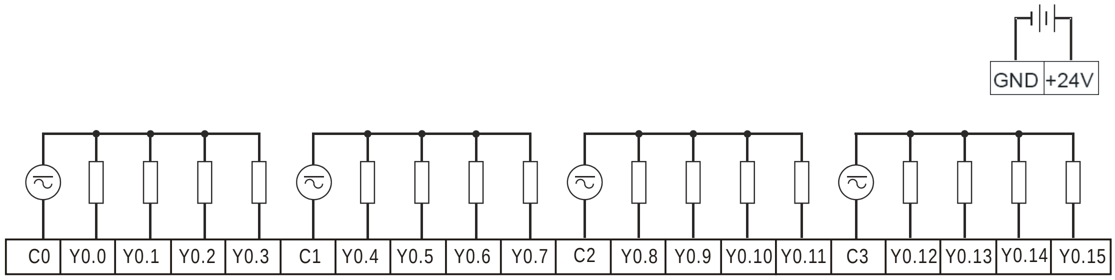
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-T (sinking)
Voltage specifications	12~24 VDC, 0.1 A



Wiring the external terminal module UB-10-OR16A:

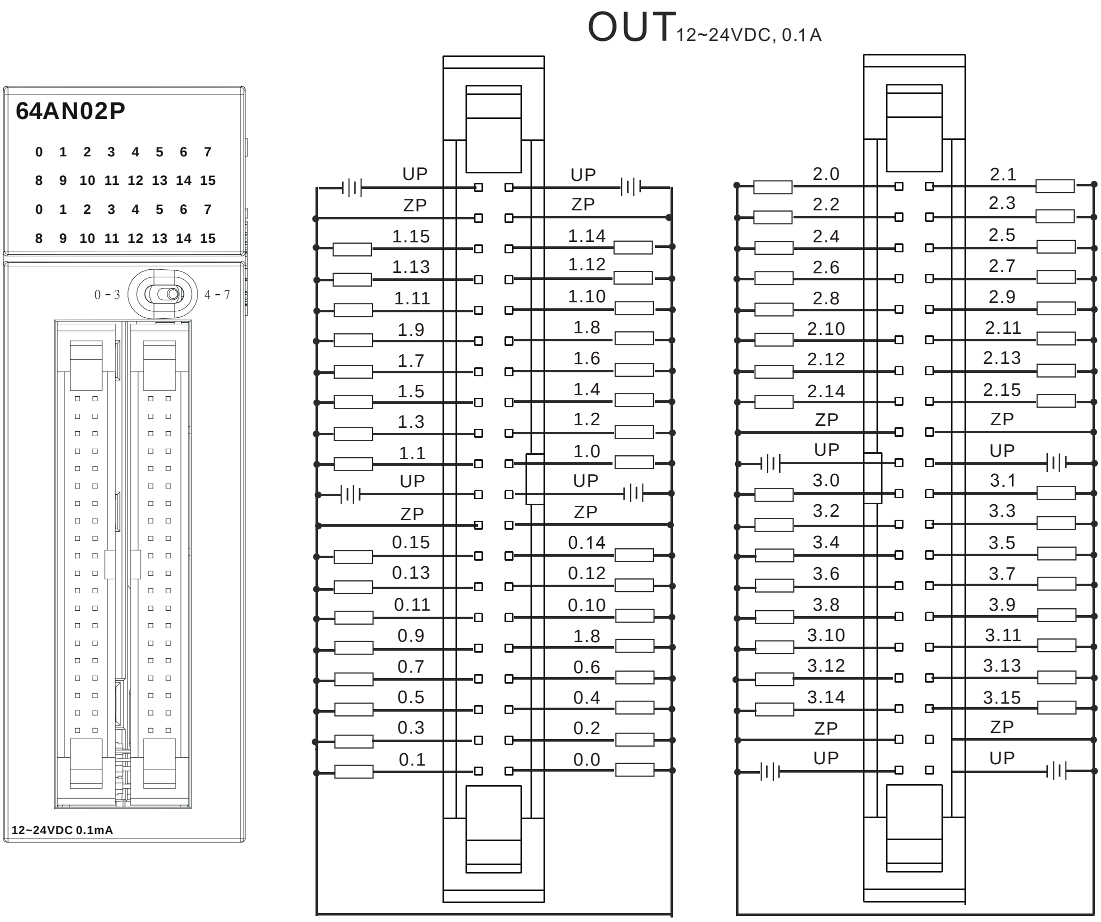
Output type	Relay-R
Voltage specifications	250 VAC, below 30 VDC



250VAC/30VDC, 2A

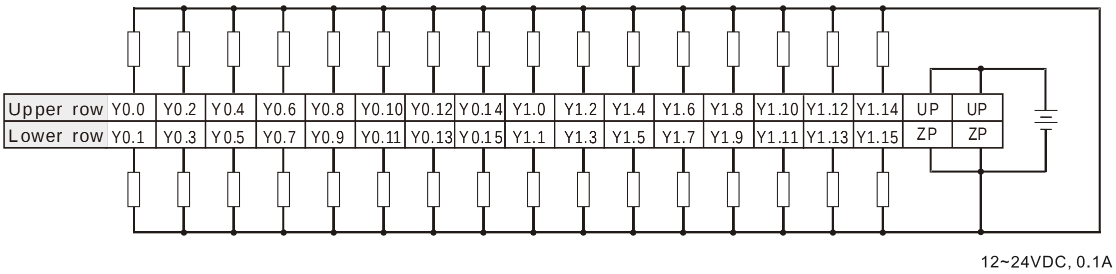
4.7.22 Wiring AH64AN02P-5C

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



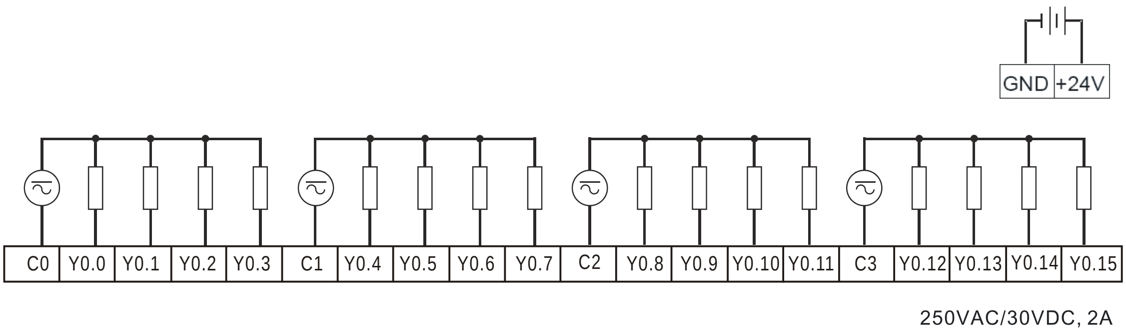
Wiring the external terminal module UB-10-OT32A:

Output type	Transistor-P (sourcing)
Voltage specifications	12~24 VDC, 0.1 A



Wiring the external terminal module UB-10-OR16B:

Output type	Relay-R
Voltage specifications	250 VAC, below 30 VDC

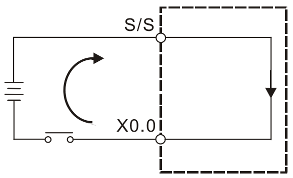
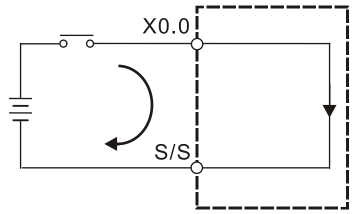


4.8 Wiring Digital Input/Output Terminals

4.8.1 Wiring Digital Input Terminals

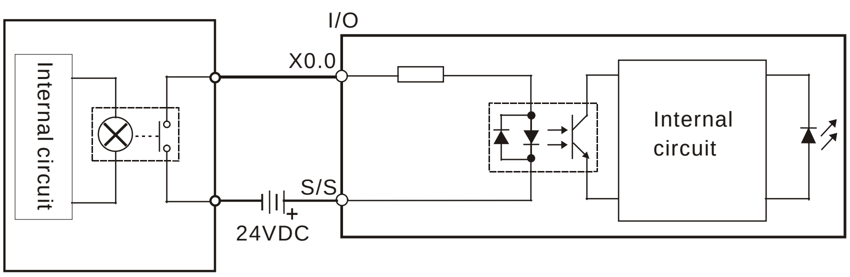
4.8.1.1 Sinking and Sourcing

The input signal is the 24 VDC power input. Sinking and sourcing are current driving capabilities of a circuit. They are defined as follows.

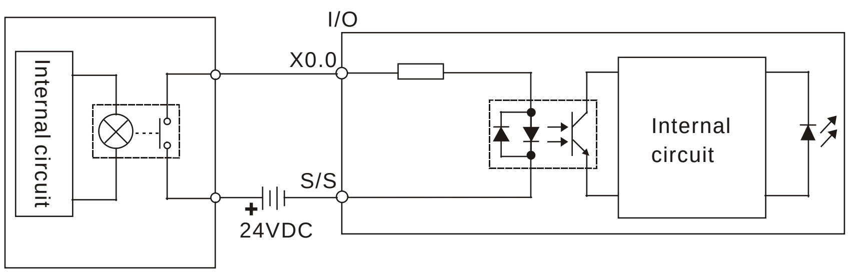
● Sinking Sinking=The current flows into the common terminal S/S.  	● Sourcing Souring=The current flows from the common terminal S/S. 

4.8.1.2 Relay Type

- Sinking

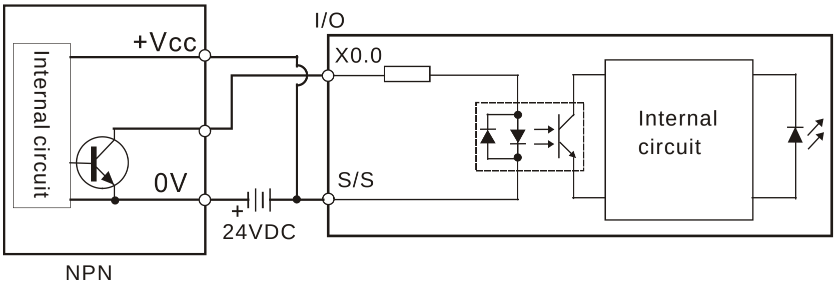


- Sourcing

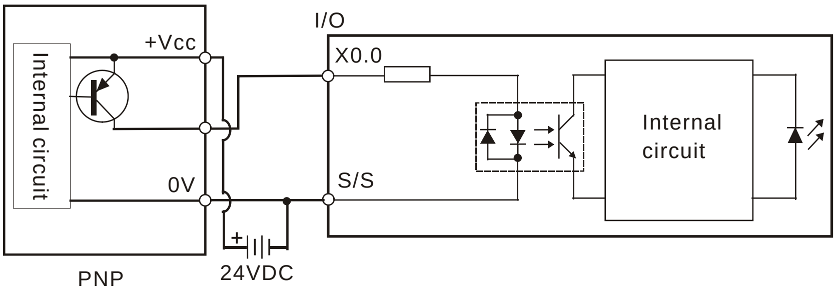


4.8.1.3 Open-collector Input Type

- Sinking
  (NPN transistor whose collector is open)



- Sourcing
  (PNP transistor whose collector is open)

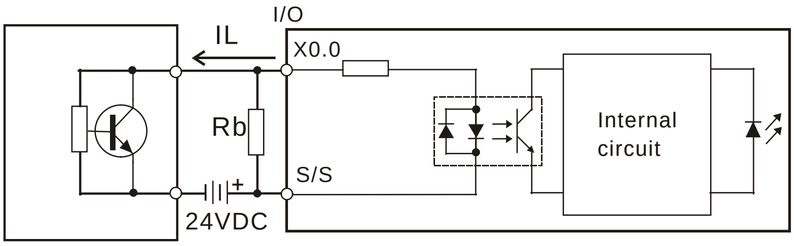


4.8.1.4 Two-wire Proximity Switch

Please use the two-wire proximity switch whose leakage current I_L is less than 1.5 mA when the switch is OFF. If the leakage current is larger than 1.5 mA, please connect the divider resistance Rb gotten from the formula below.

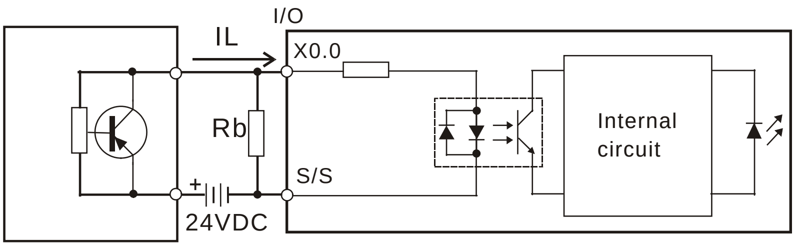
$$Rb \le \frac{6}{IL - 1.5} \quad (\mathrm{k}\,\Omega)$$

- Sinking



Two-wire proximity switch

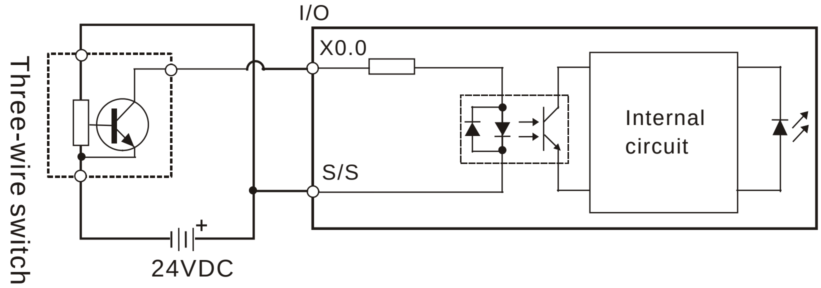
- Sourcing



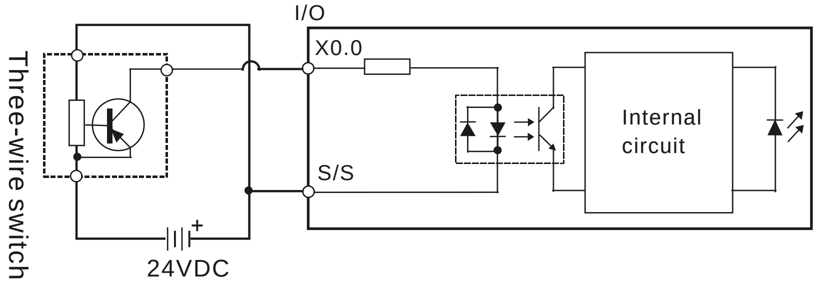
Two-wire proximity switch

4.8.1.5 Three-wire Switch

- Sinking

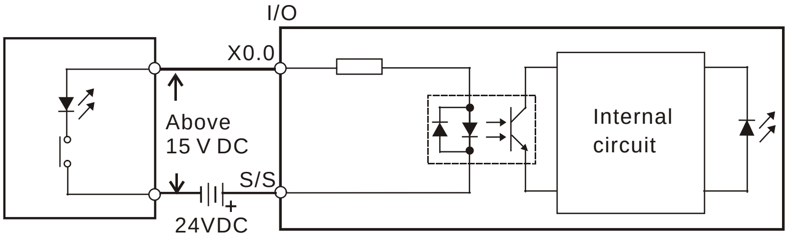


- Sourcing



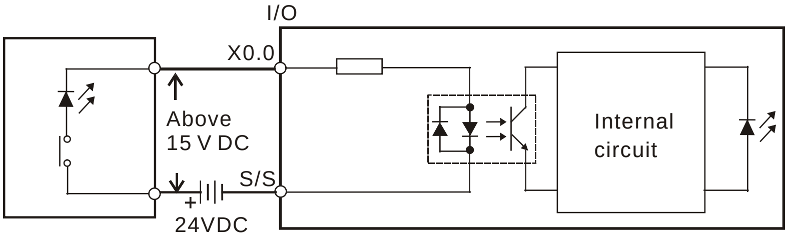
4.8.1.6 Optoelectronic Switch

- Sinking



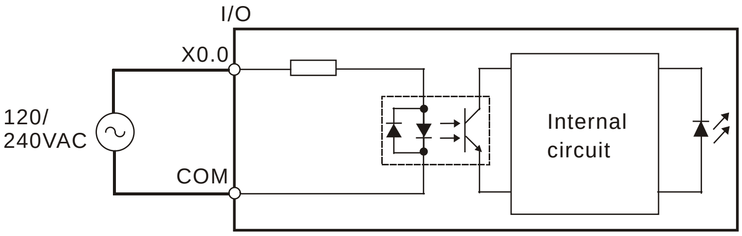
Optoelectronic switch

- Sourcing



Optoelectronic switch

4.8.1.7 Voltage Input (120~240 VAC)

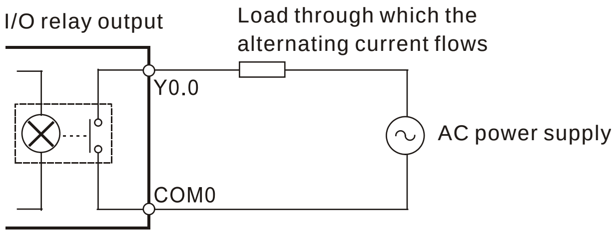


4.8.2 Wiring Digital Output Terminals

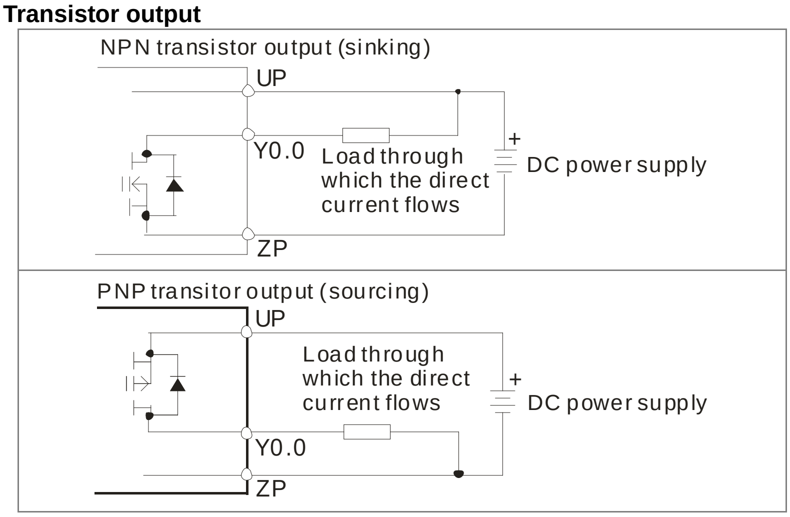
4.8.2.1 Output Circuits

There are three types of output units. They are relay outputs, transistor outputs, and TRIAC outputs.

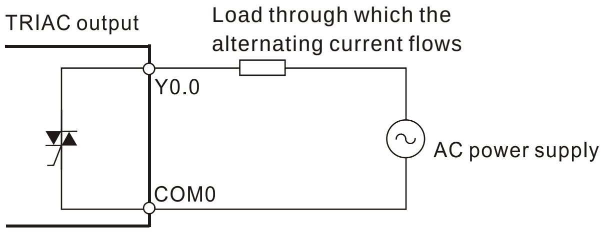
1. Relay output



2. Transistor output

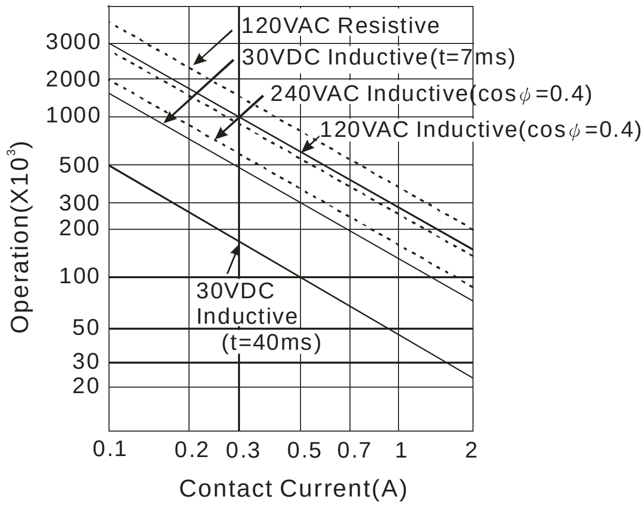


3. TRIAC output

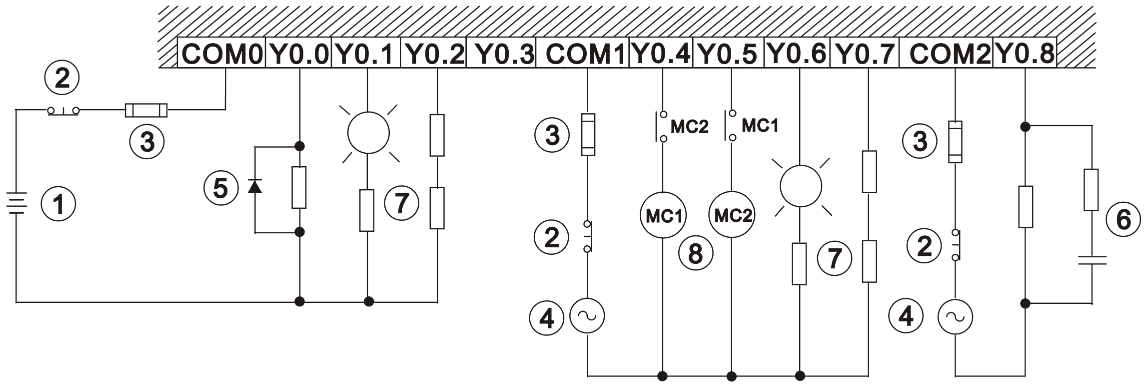


4.8.2.2 Relay Output Circuit

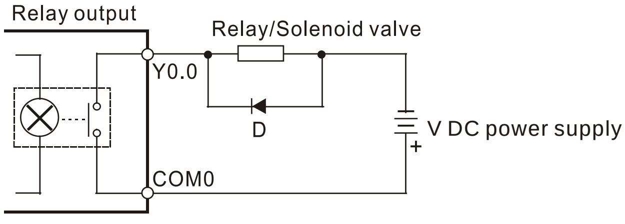
Relay terminals have no polarity. They can be applied to alternating current which passes through a load, or direct current which passes through a load. The maximum current which can passes through every relay terminal is 2 A, and the maximum current which can passes through every common terminal is 5 A. The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosψ, the time constant t(L/R)), and the current passing through the terminal. The relation is shown in the life cycle curve below.

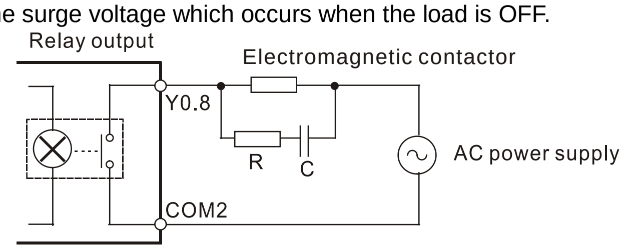


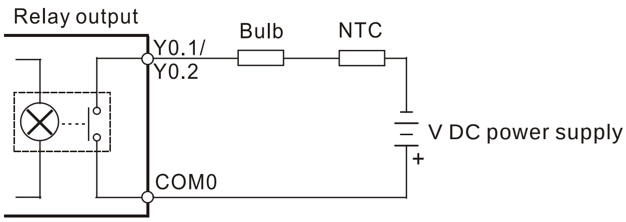
- **Relay output circuit**

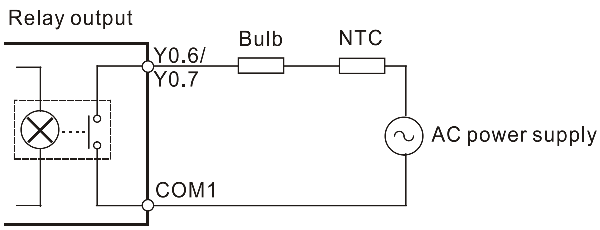


①	Direct-current power supply
②	Emergency stop: An external switch is used.
③	Fuse: To protect the output circuit, a fuse having a breaking capacity in the range of 5 A to 10 A is connected to the common terminal.
④	Alternating-current power supply

<table>
<tr><td>⑤</td><td>A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.


D: 1N4001 diode</td></tr>
<tr><td>⑥</td><td>An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage which occurs when the load is OFF.


R: 100~120 Ω
C: 0.1~0.24 uF</td></tr>
<tr><td>⑦</td><td>A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.


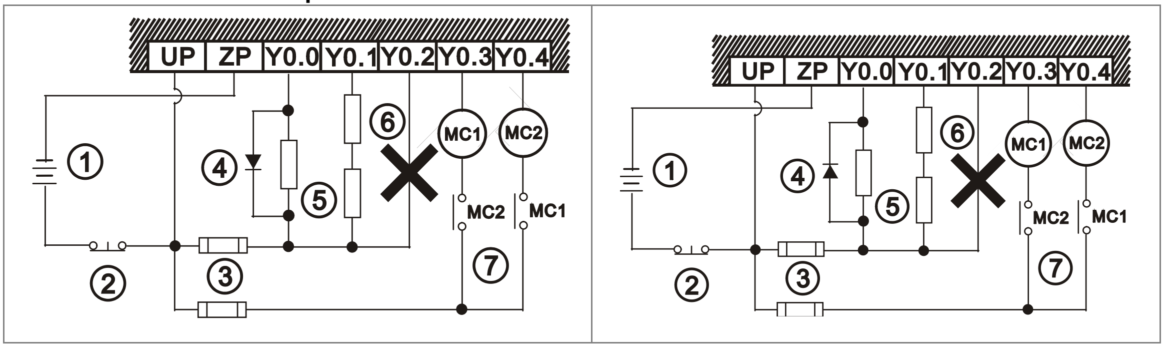
NTC:10 Ω
A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.


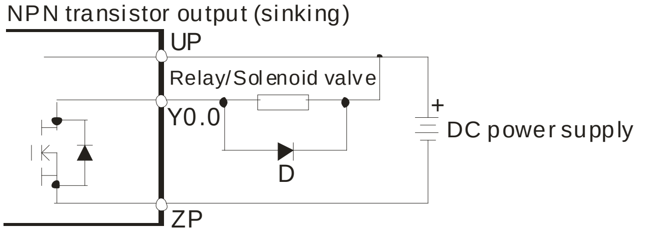
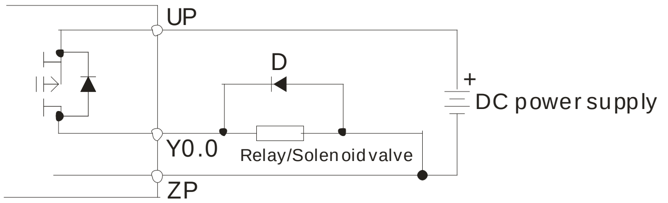
NTC: 10 Ω</td></tr>
<tr><td>⑧</td><td>Mutually exclusive output: For example, Y0.4 controls the clockwise rotation of the motor, and Y0.5 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.</td></tr>
</table>

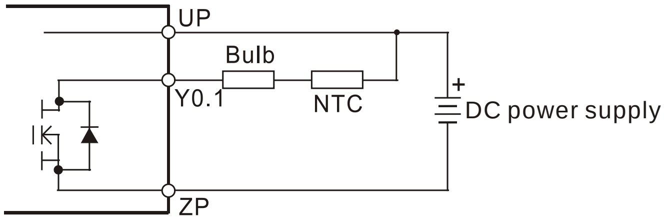
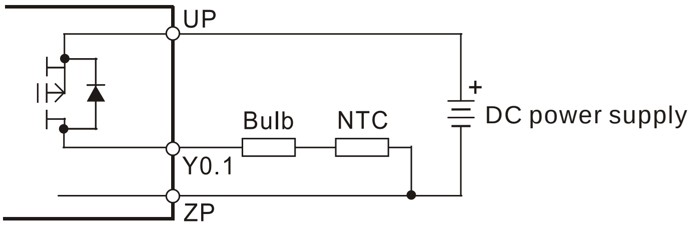
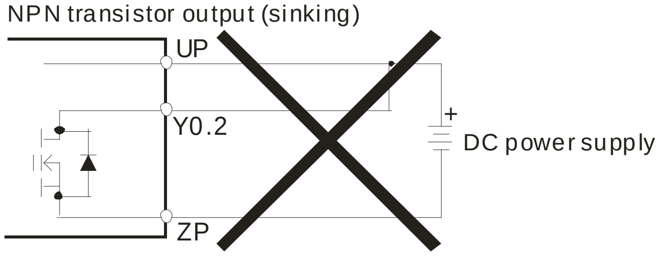
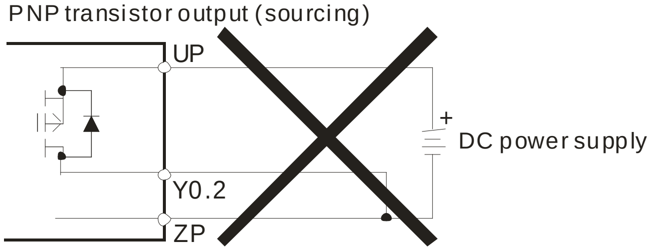
4.8.2.3 Transistor Output Circuit

The AH500 series transistor outputs are equipped with the diodes which provide the counter-electromotive force protection. They can be used if they are not turned ON/OFF frequently and there are low-power inductive loads. If they are turned ON/OFF frequently and there are high-power inductive loads, they must be connected to noise suppression circuits to reduce the noise and prevent the overvoltage or the overheating from damaging the transistor output circuit.

- **NPN/PNP transistor output circuit**



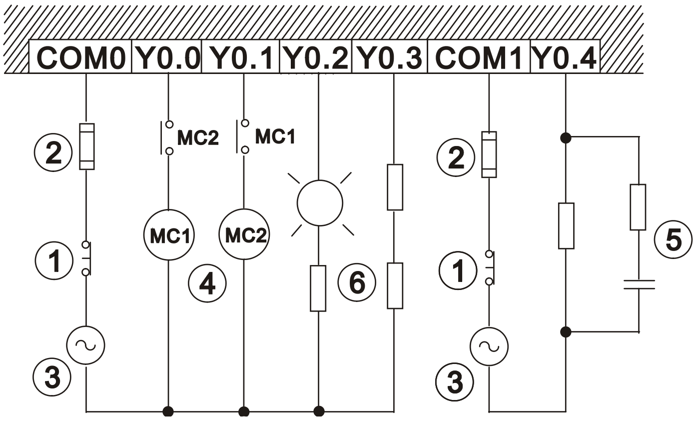
①	Direct-current power supply
②	Emergency stop
③	Fuse
④	The output terminals of a transistor module are open-collector output terminals. If Y0.0/Y0.1 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally. A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF. NPN transistor output (sinking)  D: 1N4001 diode PNP transistor output (sourcing)  D: 1N4001 diode

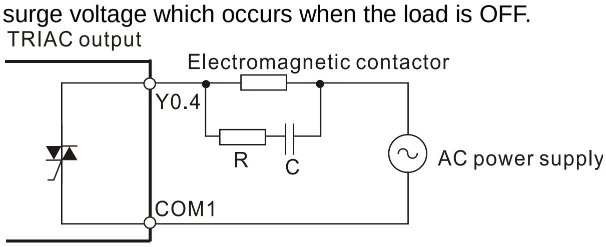
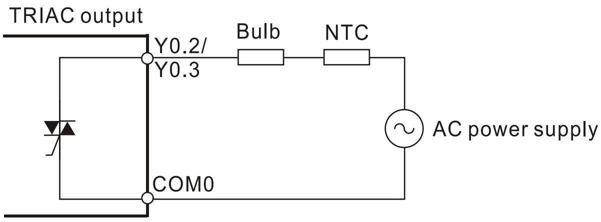
⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON. NPN transistor output (sinking)  NTC: 10 Ω PNP transistor output (sourcing)  NTC: 10 Ω
⑥	Y0.2 cannot be connected to a power supply directly. It must be connected to a load. NPN transistor output (sinking)  PNP transistor output (sourcing) 
⑦	Mutually exclusive output: For example, Y0.3 controls the clockwise rotation of the motor, and Y0.4 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

4.8.2.4 TRIAC Output Circuit

TRIAC terminals only can be applied to alternating current which passes through a load. The maximum current which can passes through every TRIAC terminal is 0.5 A, and the maximum current which can passes through every common terminal is 2 A.

- **TRIAC output circuit**

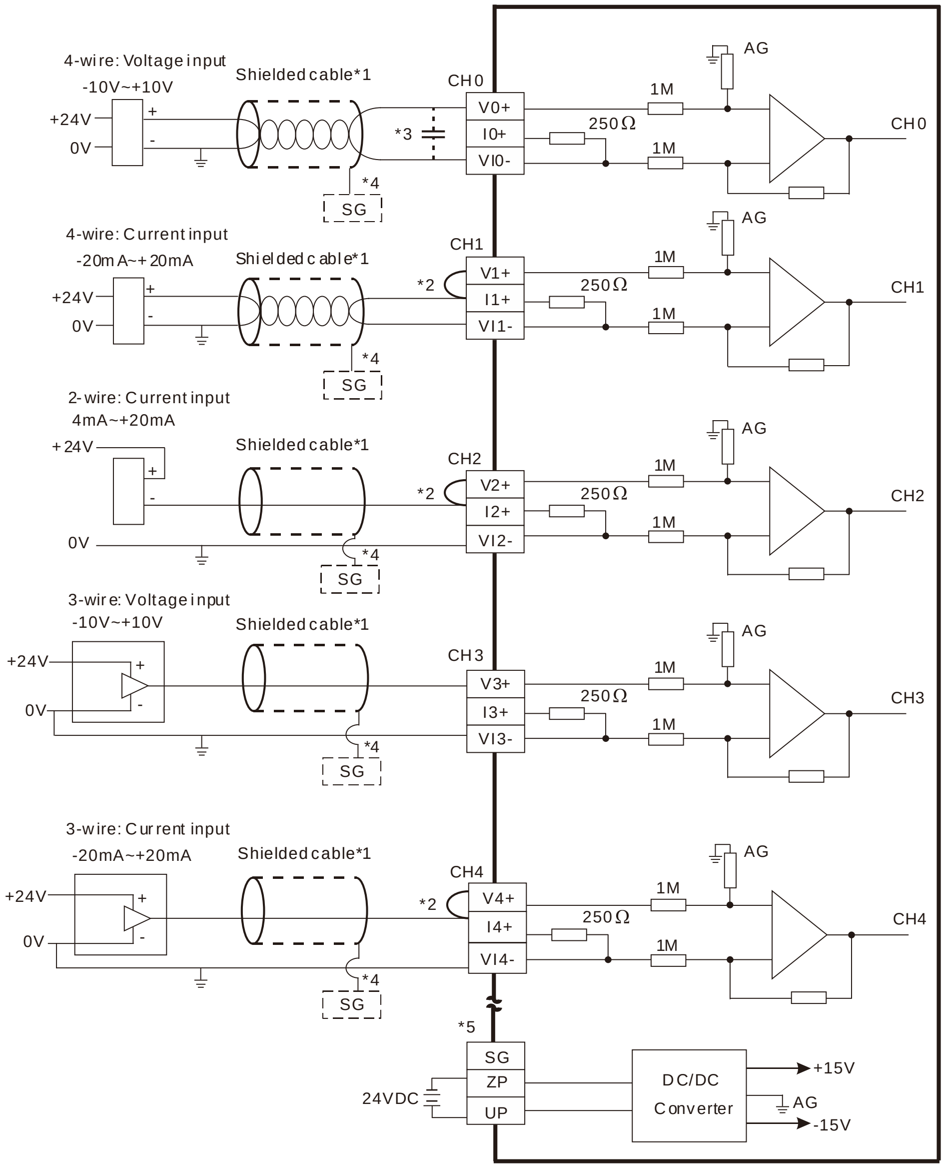


①	Emergency stop: An external switch is used.
②	Fuse: To protect the output circuit, a fuse having a breaking capacity in the range of 5 A to 10 A is connected to the common terminal.
③	Alternating-current power supply.
④	Mutually exclusive output: For example, Y0.0 controls the clockwise rotation of the motor, and Y0.1 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.
⑤	An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage which occurs when the load is OFF.  R: 100~120 Ω C: 0.1~0.24uF
⑥	A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  NTC:10 Ω

4.9 Wiring Analog Input/Output Modules

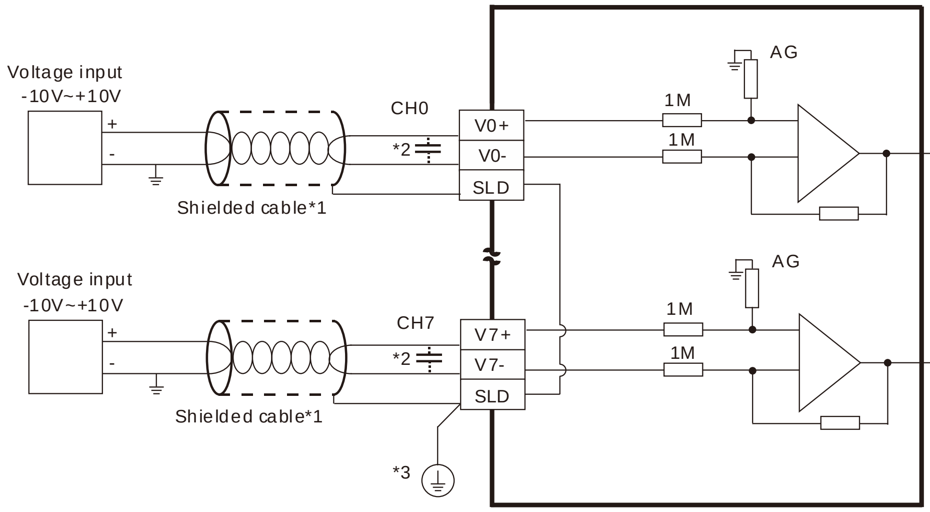
(1) Definitions of the terminals
- 2-/3-wire (passive sensor): the sensor and the system share the same power circuit.
- 4-wire (active sensor): the sensor uses independent power supply and suggested not to share the same power circuit with the system.
- Note: use cables with the same length (less than 200 m) and use terminal resistors of less than 100 ohm.

4.9.1 Wiring AH04AD-5A/AH08AD-5A



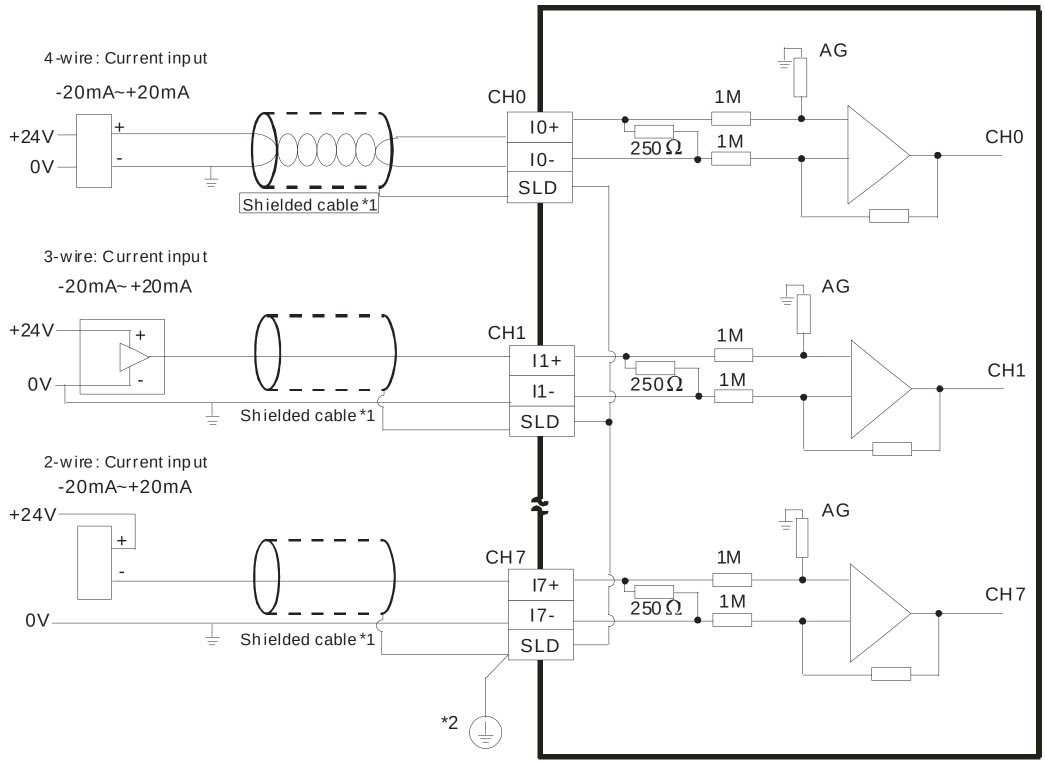
*1. Please use shielded cables to isolate the analog input signal cable from other power cables.
*2. If the module is connected to a current signal, the terminals Vn and In+ (n=0~7) must be short-circuited.
*3. If the ripple in the input voltage results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance in the range of 0.1 μF to 0.47 μF with a working voltage of 25 V.
*4. Please connect the shielded cable to the terminal SG.
*5. Once AH04AD-5A is installed on a backplane, the terminal SG on AH04AD-5A and the terminal ⏚ on the backplane will be short-circuited. Please connect the terminal ⏚ on the backplane to the ground terminal ⏚.

4.9.2 Wiring AH08AD-5B



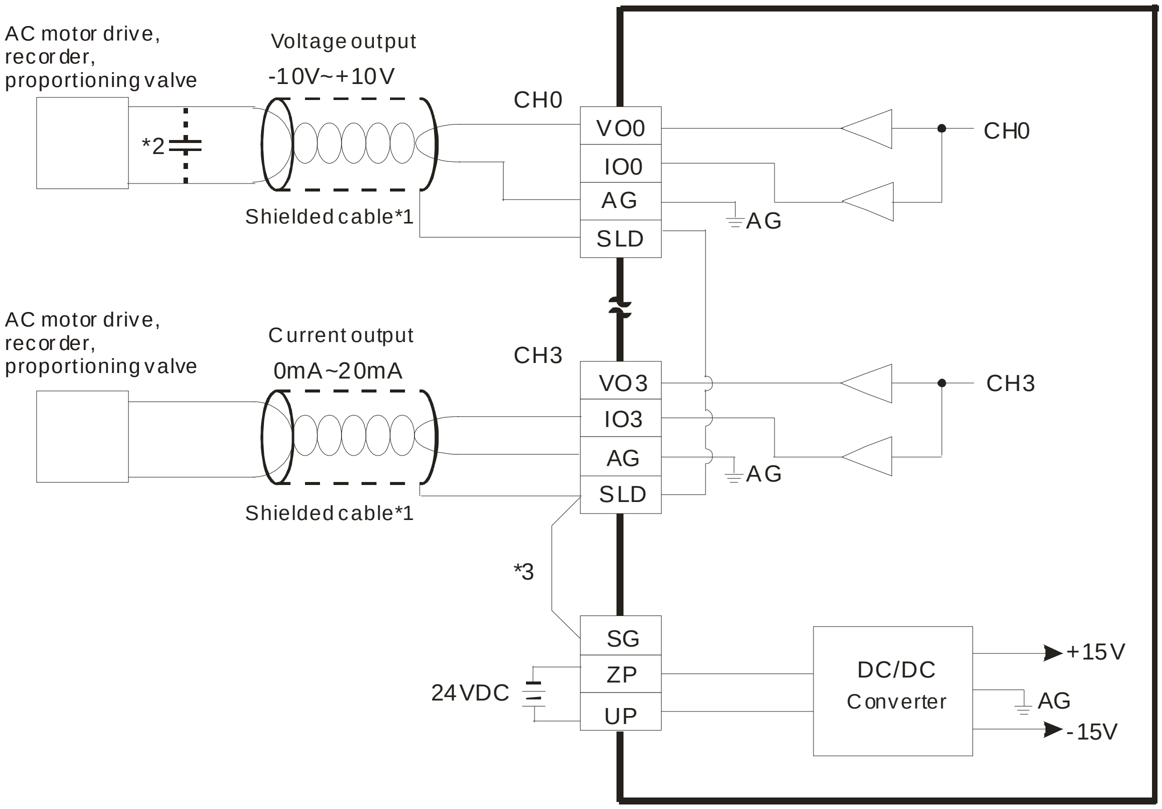
*1. Please use shielded cables to isolate the analog input signal cable from other power cables.
*2. If the ripple in the input voltage results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance in the range of 0.1 μF to 0.47 μF with a working voltage of 25 V.
*3. Please connect the terminal SLD to the ground terminal ⏚.

4.9.3 Wiring AH08AD-5C



*1. Please use shielded cables to isolate the analog input signal cable from other power cables.
*2. Please connect the terminal SLD to the ground terminal ⏚.

4.9.4 Wiring AH04DA-5A / AH08DA-5A

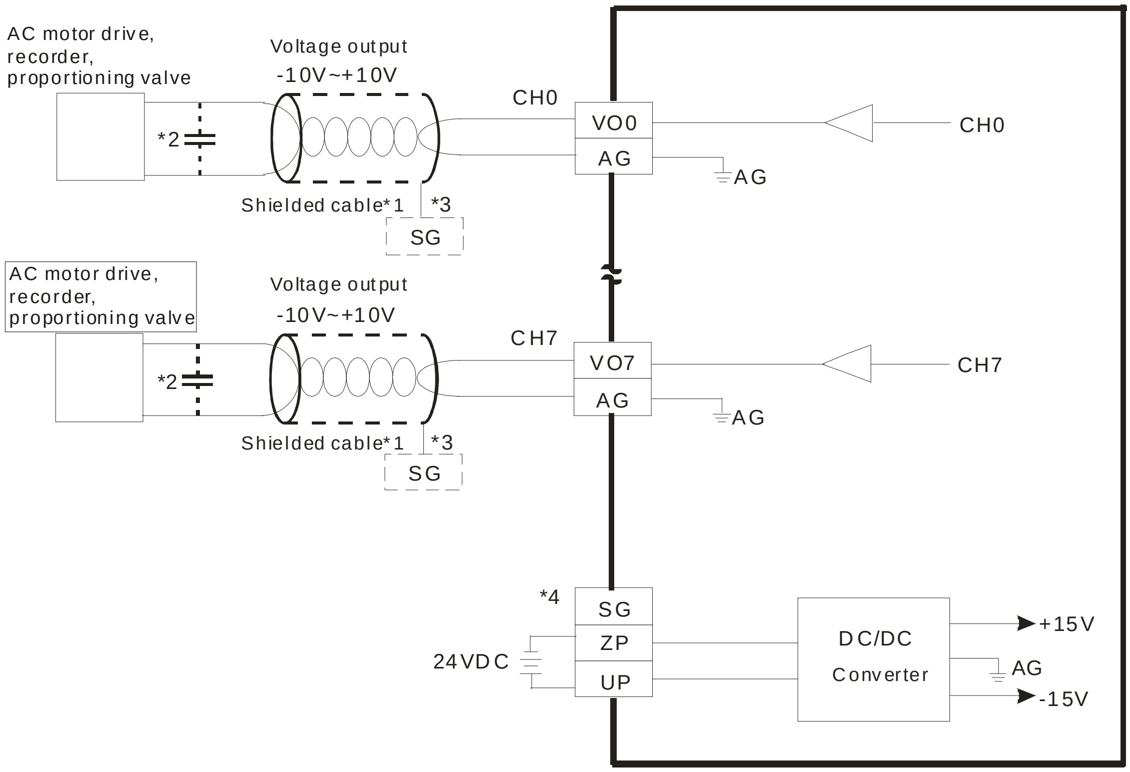


*1. Please use the shielded cables to isolate the analog output signal cable from other power cables.

*2. If a ripple is large for the input terminal of the load and results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance in the range of 0.1 μF to 0.47 μF with a working voltage of 25 V.

*3. Please connect the terminal SLD to the terminal SG. Once AH04DA-5A is installed on a backplane, the terminal SG on AH04DA-5A and the terminal ⏚ on the backplane will be short-circuited. Please connect the terminal ⏚ on the backplane to the ground terminal ⏚.

4.9.5 Wiring AH08DA-5B



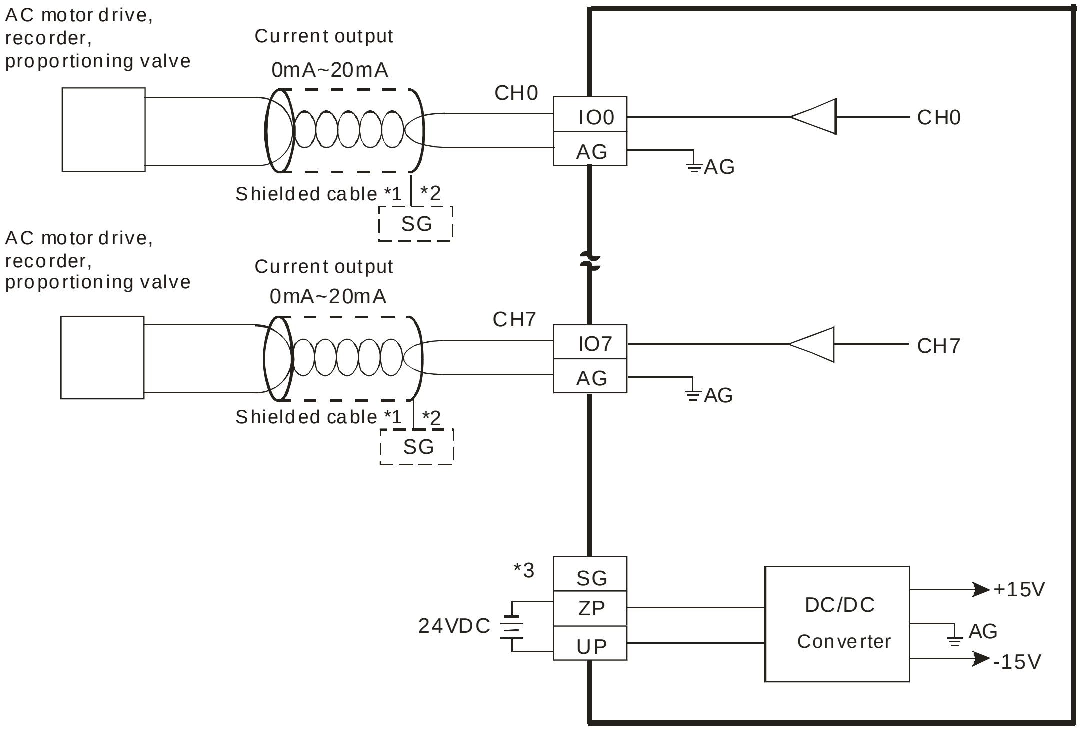
*1. Please use the shielded cables isolate the analog output signal cable from other power cables.

*2. If a ripple is large for the input terminal of the load and results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance in the range of 0.1 μF to 0.47 μF with a working voltage of 25 V.

*3. Please connect the shielded cable to the terminal SG.

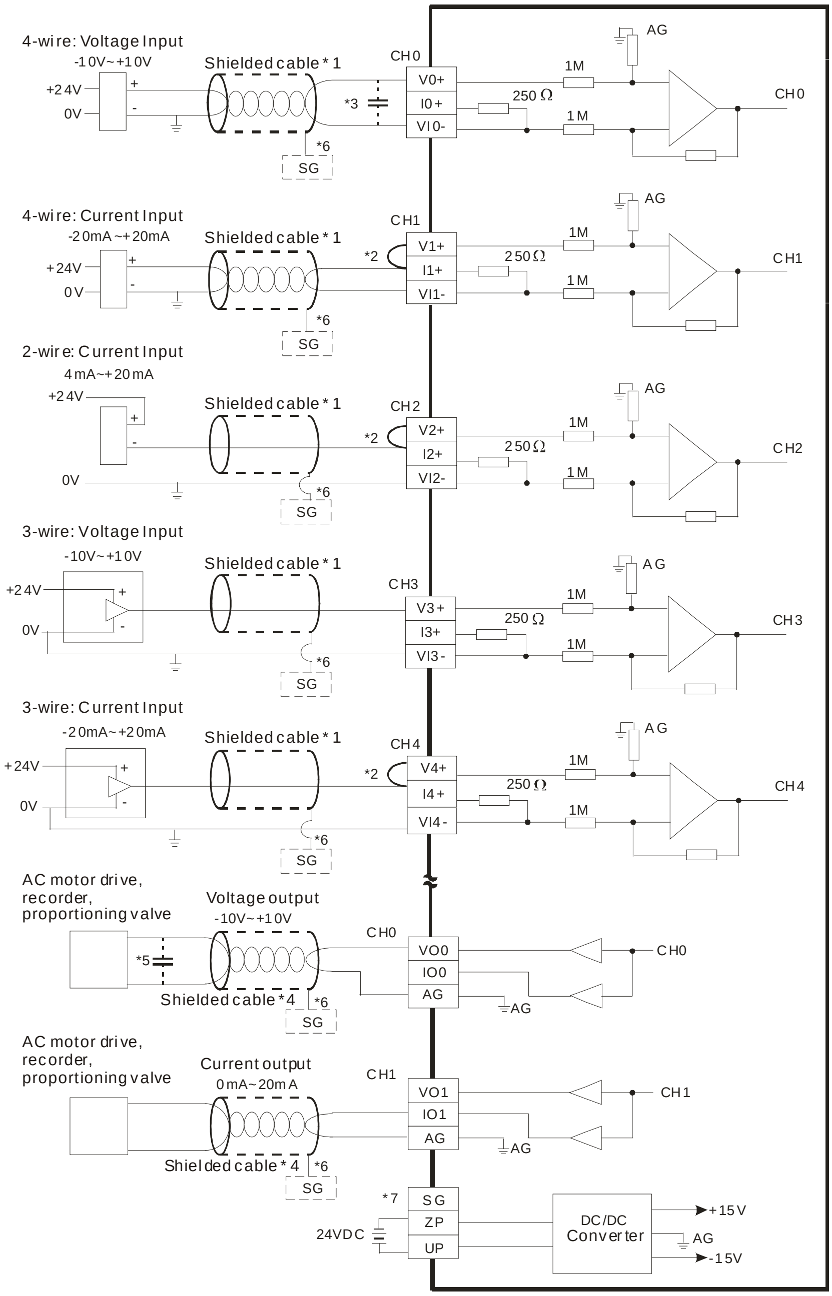
*4. Once AH08DA-5B is installed on a backplane, the terminal SG on AH08DA-5B and the terminal ⏚ on the backplane will be short-circuited. Please connect the terminal ⏚ on the backplane to the ground terminal ⏚.

4.9.6 Wiring AH08DA-5C



*1. Please the shielded cables isolate the analog output signal cable from other power cables.
*2. Please connect the shielded cables to the terminal SG.
*3. Once AH08DA-5C is installed on a backplane, the terminal SG on AH08DA-5C and the terminal ⏚ on the backplane will be short-circuited. Please connect the terminal ⏚ on the backplane to the ground terminal ⏚.

4.9.7 Wiring AH06XA-5A



*1. Please isolate the analog input signal cable from other power cables.

*2. If the module is connected to a current signal, the terminals V1+ and I1+ must be short-circuited, and the terminals V2+ and I2+ must be short-circuited.

*3. If the ripple in the input voltage results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance in the range of 0.1 μF to 0.47 μF with a working voltage of 25 V.

*4. Please isolate the analog output signal cable from other power cables.

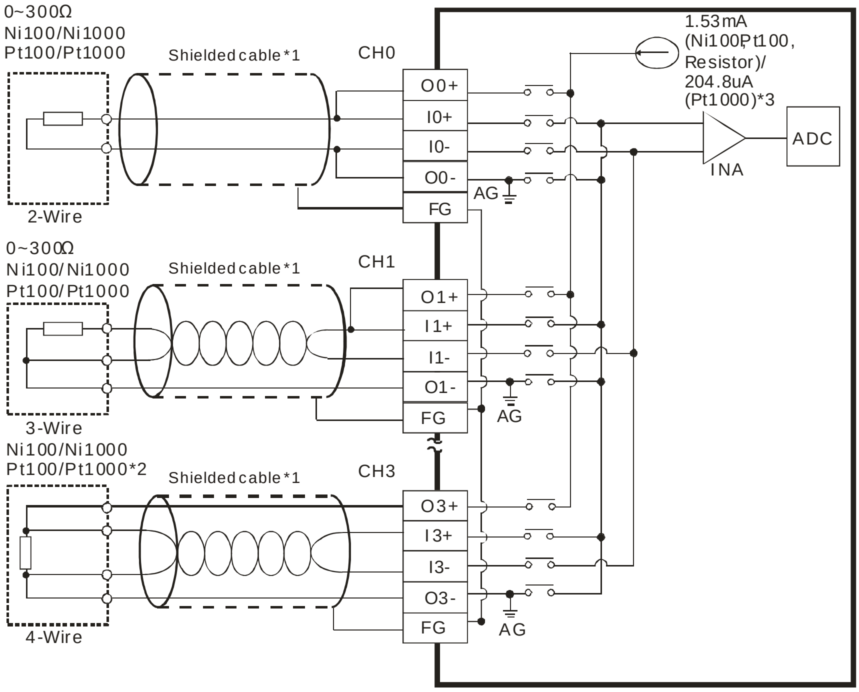
*5. If a ripple is large for the input terminal of the load and results in the noise interference with the wiring, please connect the module to the capacitor having a capacitance in the range of 0.1 μF to 0.47 μF with a working voltage of 25 V.

*6. Please connect the shielded cables to the terminal SG.

*7. Once AH06XA-5A is installed on a backplane, the terminal SG on AH06XA-5A and the terminal ⏚ on the backplane will be short-circuited. Please connect the terminal ⏚ on the backplane to the ground terminal ⏚.

4.10 Wiring Temperature Measurement Modules

4.10.1 Wiring AH04PT-5A



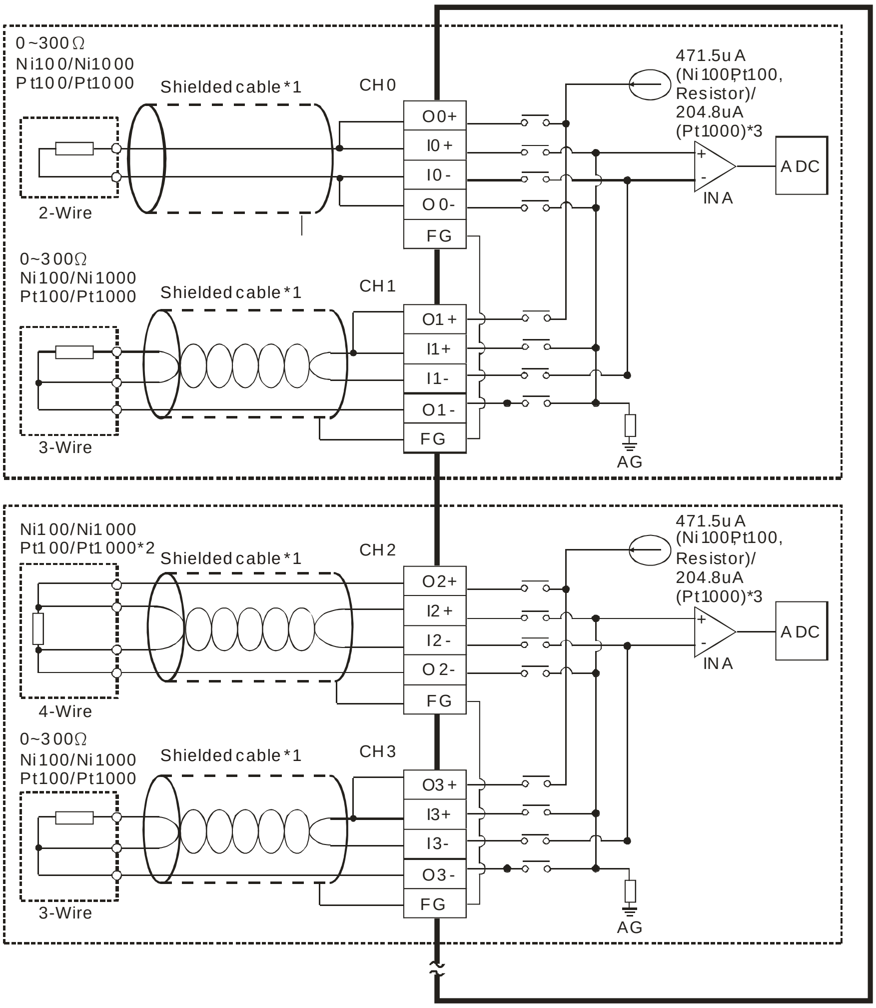
*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to an Ni100/Ni1000/Pt100/Pt1000 sensor, and should be kept separate from other power cables and cables which generate noise. Please use a three-wire temperature sensor. If users want to use a two-wire temperature sensor, O**n**+ and I**n**+ must be short-circuited, and O**n**- and I**n**- must be short-circuited. (**n** is in the range of 0 to 3.)

*2. If users want to measure resistance in the range of 0 Ω to 300 Ω, they can use a two-wire or three-wire sensor instead of a four-wire sensor.

*3. Users need to select an appropriate sensor. If an Ni100 temperature sensor, a Pt100 temperature sensor, or a resistance sensor is used, the internal excitation current is 1.53 mA. If an Ni1000 temperature sensor, or a Pt1000 temperature sensor is used, the internal excitation current is 204.8 μA.

◆ Note: use cables with the same length (less than 200 m) and use terminal resistors of less than 20 ohm.

4.10.2 Wiring AH08PTG-5A



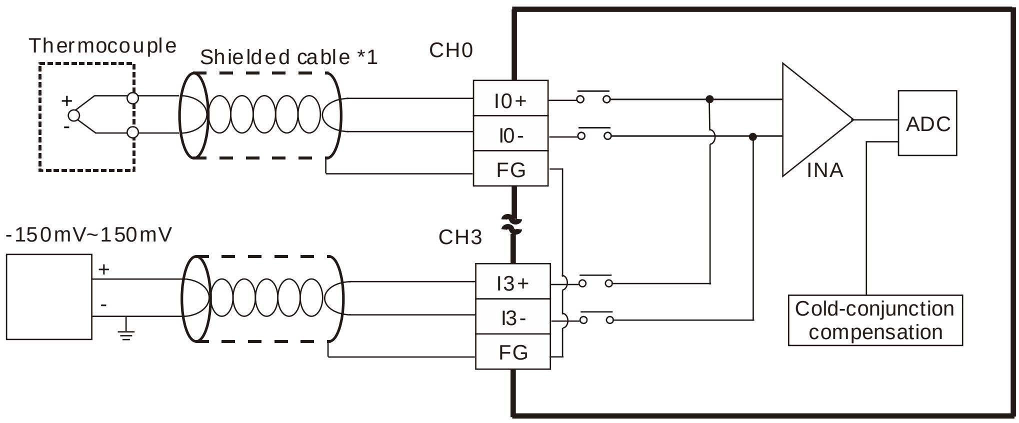
*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to an Ni100/Ni1000/Pt100/Pt1000 sensor, and should be kept separate from other power cables and cables which generate noise. Please use a three-wire temperature sensor. If users want to use a two-wire temperature sensor, O**n**+ and I**n**+ must be short-circuited, and O**n**- and I**n**- must be short-circuited. (**n** is in the range of 0 to 7.)

*2. If users want to measure resistance in the range of 0 Ω to 300 Ω, they can use a two-wire or three-wire sensor instead of a four-wire sensor.

*3. User need to select an appropriate sensor. If an Ni100 temperature sensor, a Pt100 temperature sensor, or a resistance sensor is used, the internal excitation current is 471.5 μA. If an Ni1000 temperature sensor, or a Pt1000 temperature sensor is used, the internal excitation current is 204.8 μA.

◆ Note: use cables with the same length (less than 200 m) and use terminal resistors of less than 20 ohm.

4.10.3 Wiring AH04TC-5A



*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to a type J, type K, type R, type S, type T, type E, or type N thermocouple, and should be kept separate from other power cables and cables which generate noise.

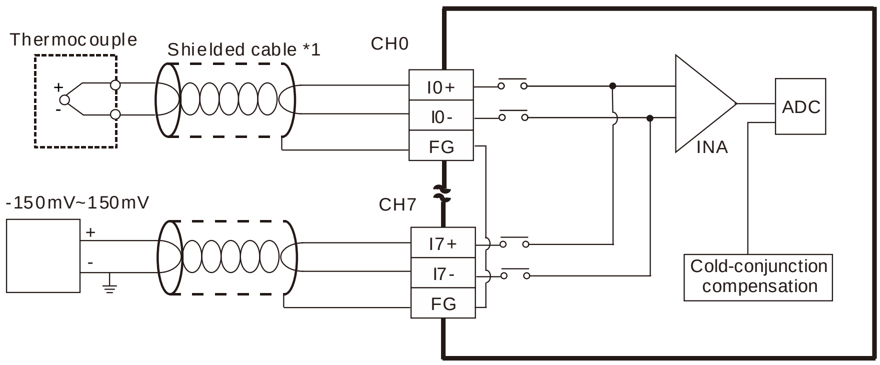
Note1: do not wire empty terminals.

Note2: only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than

50 m.

Note3: TC modules must run for 30 minutes before they start to take any temperature measurement.

4.10.4 Wiring AH08TC-5A



*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable which can be connected to type J, type K, type R, type S, type T, type E, or type N thermocouple, and should be kept separate from other power cables and cables which generate noise.

Note1: do not wire empty terminals.

Note2: only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than 50 m.

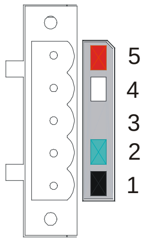
Note3: TC modules must run for 30 minutes before they start to take any temperature measurement.

4.11 Wiring Network Modules

4.11.1 Wiring AH10DNET-5A

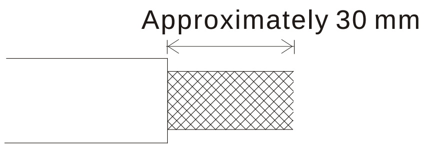
4.11.1.1 DeviceNet Connector

Pin	Signal	Color	Description
5	V+	Red	24 VDC
4	CAN_H	White	Signal (positive pole)
3	SHIELD	-	It is connected to a shielded cable.
2	CAN_L	Blue	Signal (negative pole)
1	V-	Black	0 VDC

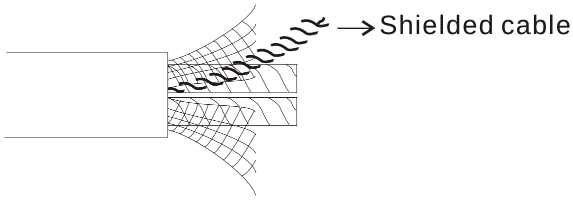


4.11.1.2 Connecting a Cable to the DeviceNet Connector

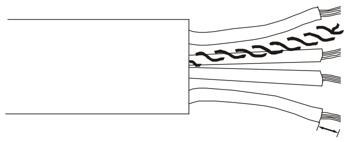
- Remove the 30 millimeter plastic jacket of a cable with a professional tool. Please do not damage the shielded cable when the plastic jacket is removed.



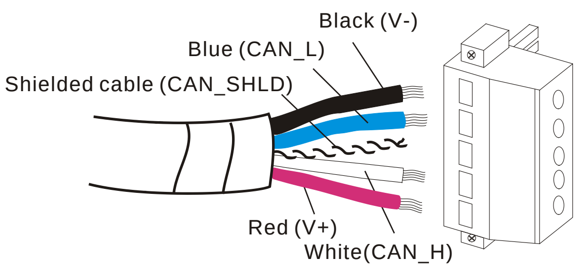
- After users remove the metallic shield and the foil, they can see two power cables (in red and black respectively), two signal cables (in blue and white respectively), and one shielded cable.



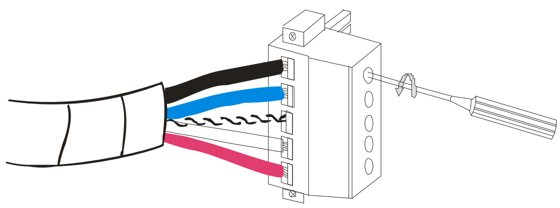
- After the metallic shield and the foil are removed, the users need to remove the plastic jackets of the power cables and the plastic jackets of the signal cables properly.



- Insert the communication cable into the holes in the connector.

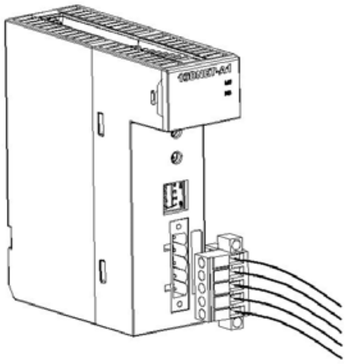


- After the communication cable is inserted into the holes in the connector, tighten the screws on the connector with a slotted screwdriver.



4.11.1.3 Installing the DeviceNet Connector

- After the wiring is complete, users can insert the DeviceNet connector into the interface.
- Tighten the two screws on the DeviceNet connector.



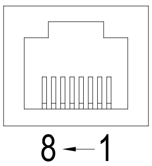
Points for attention:

- After the communication cable is kept separate from the power cable, the electromagnetic interference is reduced.
- Only after the both ends of the shielded cable are grounded can the shielded cable be brought into full play.

4.11.2 Wiring AH10EN-5A / AH15EN-5A

RJ45 communication port

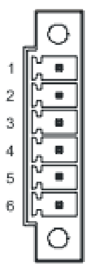
Pin	Signal	Description
1	TX+	Transmitting data (positive pole)
2	TX-	Transmitting data (negative pole)
3	RX+	Receiving data (positive pole)
4	--	N/C
5	--	N/C
6	RX-	Receiving data (negative pole)
7	--	N/C
8	--	N/C



4.11.3 Wiring AH10SCM-5A

RS-485/RS-422 communication port

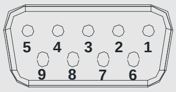
Pin	RS-485	RS-422
1	N/C	TX+
2	N/C	TX-
3	D+	RX+
4	D-	RX-
5	SG	SG
6	N/C	SG



4.11.4 Wiring AH15SCM-5A

RS-232 COM Port communication port

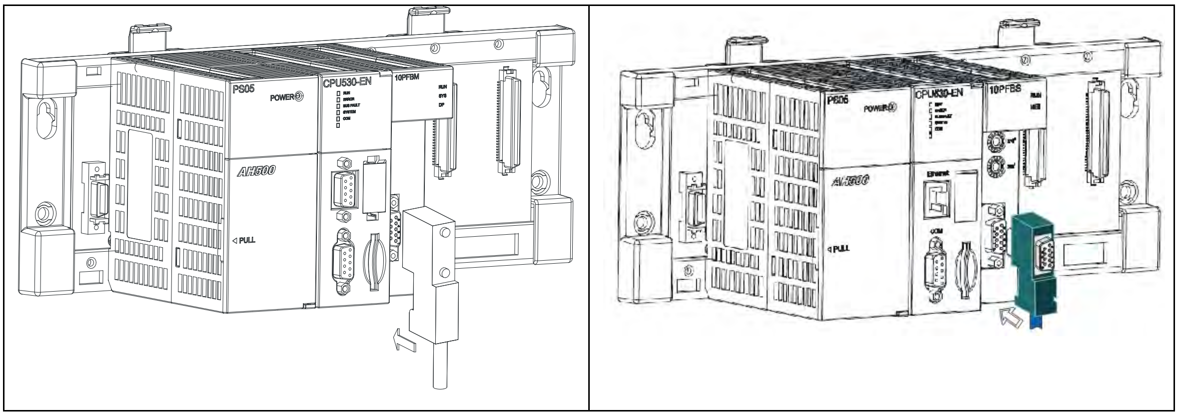
Pin	RS-485
1	N/C
2	TX
3	RX
4	N/C
5	GND
6	N/C
7	N/C
8	N/C
9	N/C



4.11.5 Wiring AH10PFBM-5A / AH10PFBS-5A

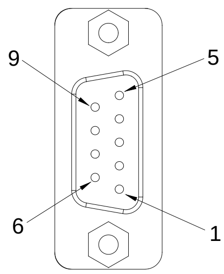
4.11.5.1 Connecting the PROFIBUS-DP Connector

- Insert the PROFIBUS-DP connector into the communication port on AH10PFBM-5A/AH10PFBS-5A. Tighten the screws on the PROFIBUS-DP connector to ensure that AH10PFBM-5A/AH10PFBS-5A is reliably connected to the PROFIBUS-DP connector.



4.11.5.2 Definitions of the Pins in the PROFIBUS-DP Port

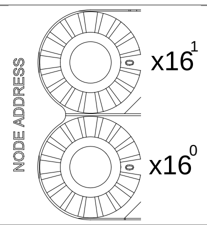
Pin	Definition	Description
1	--	N/C
2	--	N/C
3	RxD/TxD-P	Receiving/Sending data (P (B))
4	--	N/C
5	DGND	Data reference potential (C)
6	VP	Supplying positive voltage (5 V)
7	--	N/C
8	RxD/TxD-N	Receiving/Sending data (N (A))
9	--	N/C



4.11.5.3 Setting a PROFIBUS Node Address by the Knobs

The address knobs on AH10PFBM-5A/AH10PFBS-5A are used to set the node address of AH10PFBM-5A/AH10PFBS-5A on a PROFIBUS-DP network. They are knobs which can be turned. One knob corresponds to x16^0, and the other node corresponds to x16^1. Setting range: 0~F

Address	Definition
H'1~H'7D	Valid PROFIBUS node address
H'0 or H'7E~H'FF	Invalid PROFIBUS node address



Example: If the node address of AH10PFBM-5A/AH10PFBS-5A is 26 (decimal value), users have to turn the knob corresponding to x16^1 to position 1, and turn the knob corresponding to x16^0 to position A.
26 (decimal value) = 1A (hexadecimal value)=1×16^1 + A×16^0

Points for attention:

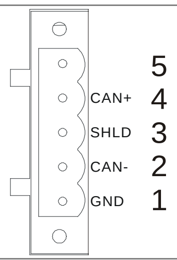
- If users set the node address of AH10PFBM-5A/AH10PFBS-5A when AH10PFBM-5A/AH10PFBS-5A is not supplied with power, they have to power AH10PFBM-5A/AH10PFBS-5A after the node address of AH10PFBM-5A/AH10PFBS-5A is set.
- If users change the node address of AH10PFBM-5A/AH10PFBS-5A when AH10PFBM-5A/AH10PFBS-5A is powered, the change will not take effect immediately after the node address of AH10PFBM-5A/AH10PFBS-5A is changed, and it will take effect after the users cut off the power supplied to AH10PFBM-5A/AH10PFBS-5A and then power AH10PFBM-5A/AH10PFBS-5A again.
- To prevent the address knobs on AH10PFBM-5A/AH10PFBS-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AH10PFBM-5A/AH10PFBS-5A.

4.11.6 Wiring AH10COPM-5A

4.11.6.1 CANopen Communication Connector

A CANopen connector is connected to a CANopen network. Please wire AH10COPM-5A by using the connector attached to AH10COPM-5A.

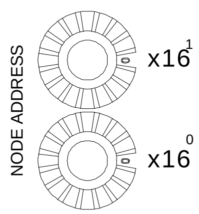
Pin	Signal	Description
5	-	Reserved
4	CAN+	CAN_H
3	SHLD	Shielded cable
2	CAN-	CAN_L
1	GND	0 VDC



4.11.6.2 Address Knobs

The address knobs on AH10COPM-5A are used to set the node address of AH10COPM-5A on a CANopen network. Setting range: 1~7F (0 and 80~FF can not be used.)

Setting	Description
1~7F	Valid CANopen node address
0, 80 ~ FF	Invalid CANopen node address



Example: If the station address of AH10COPM-5A is 16#26, users have to turn the knob corresponding to $x16^1$ to position 2, and turn the knob corresponding to $x16^0$ to position 6.

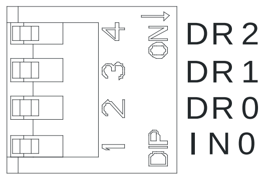
Points for attention:

- After the station address of AH10COPM-5A is changed, users have to power AH10COPM-5A again, otherwise the change will not take effect.
- To prevent the address knobs on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AH10COPM-5A.

4.11.6.3 Function Switch

The function switch on AH10COPM-5A is used to set the communication speed at which AH10COPM-5A is connected to a CANopen network. There is a limit on the maximum communication distance to which a communication speed corresponds.

DR 2	DR 1	DR 0	Communication speed	Maximum communication distance
OFF	OFF	OFF	10 kbps	5000 m
OFF	OFF	ON	20 kbps	2500 m
OFF	ON	OFF	50 kbps	1000 m
OFF	ON	ON	125 kbps	500 m
ON	OFF	OFF	250 kbps	250 m
ON	OFF	ON	500 kbps	100 m
ON	ON	OFF	800 kbps	50 m
ON	ON	ON	1 Mbps	25 m
IN 0				Reserved



Points for attention:

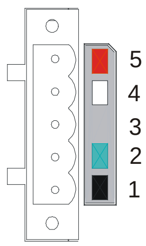
- After users change the communication speed at which AH10COPM-5A is connected to a CANopen network, they have to power AH10COPM-5A again, otherwise the change will not take effect.
- To prevent the DIP switch on AH10COPM-5A from being scratched, please carefully use a slotted screwdriver to rotate the DIP switch on AH10COPM-5A.

4.12 Wiring Remote I/O Modules

4.12.1 Wiring AHRTU-DNET-5A

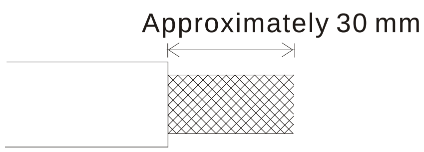
4.12.1.1 DeviceNet Connector

Pin	Signal	Color	Description
5	V+	Red	24 VDC
4	CAN_H	White	Signal (positive pole)
3	Ground	-	It is connected to a shielded cable.
2	CAN_L	Blue	Signal (negative pole)
1	V-	Black	0 VDC

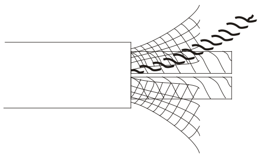


4.12.1.2 Connecting a Cable to the DeviceNet Connector

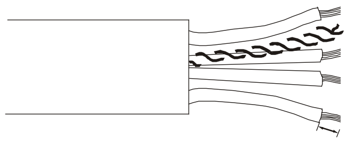
- Remove the 30 millimeter plastic jacket of a cable with a professional tool. Please do not damage the shielded cable when the plastic jacket is removed.



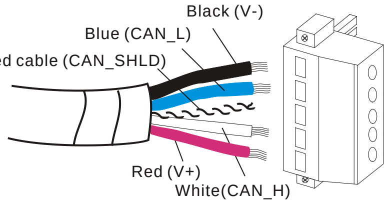
- After users remove the metallic shield and the foil, they can see two power cables (in red and black respectively), two signal cables (in blue and white respectively), and one shielded cable.



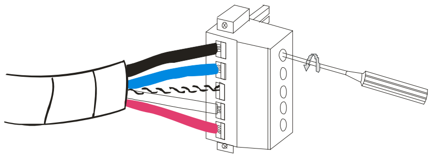
- After the metallic shield and the foil are removed, the users need to remove the plastic jackets of the power cables and the plastic jackets of the signal cables properly.



- Insert the communication cable into the holes in the connector.

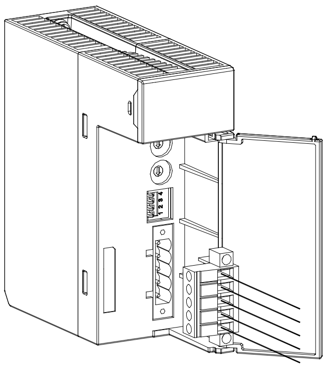


- After the communication cable is inserted into the holes in the connector, tighten the screws on the connector with a slotted screwdriver.



4.12.1.3 Installing the DeviceNet Connector

- After the wiring is complete, users can insert the DeviceNet connector into the interface.
- Tighten the two screws on the DeviceNet connector.



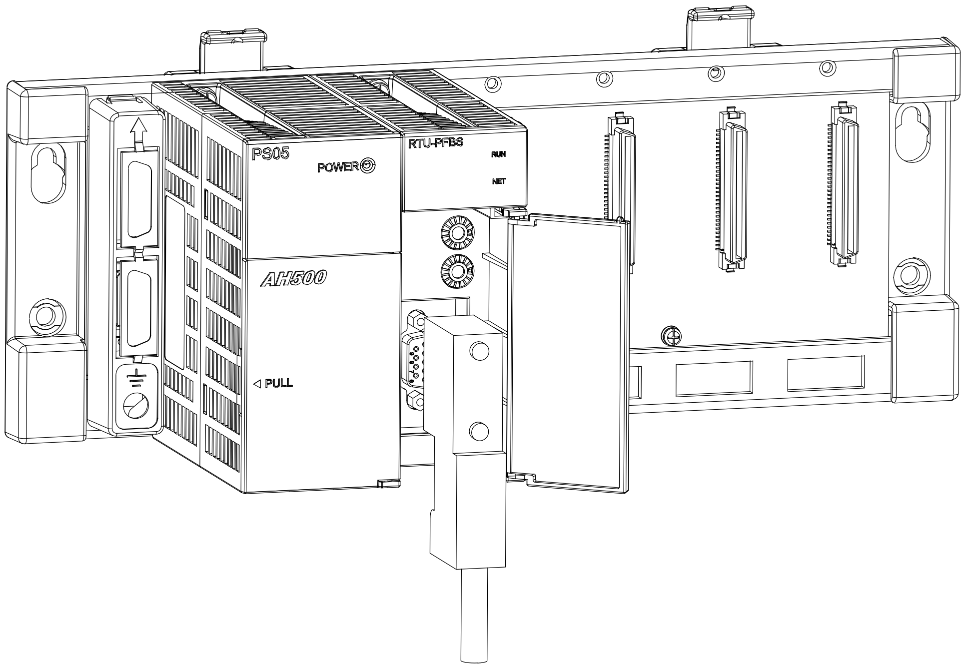
Points for attention:

- After the communication cable is kept separate from the power cable, the electromagnetic interference is reduced.
- Only after the both ends of the shielded cable are grounded can the shielded cable be brought into full play.

4.12.2 Wiring AHRTU-PFBS-5A

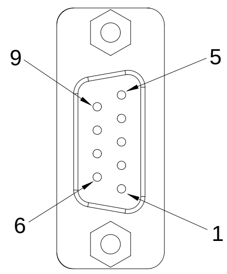
4.12.2.1 Connecting the PROFIBUS-DP Connector

- Insert the PROFIBUS-DP connector into the communication port on AHRTU-PFBS-5A. Tighten the screws on the PROFIBUS-DP connector to ensure that AHRTU-PFBS-5A is reliably connected to the PROFIBUS-DP connector.



4.12.2.2 Definitions of the Pins in the PROFIBUS-DP Port

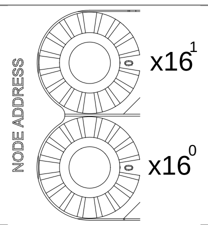
Pin	Definition	Description
1	--	N/C
2	--	N/C
3	RxD/TxD-P	Receiving/Sending data (P (B))
4	--	N/C
5	DGND	Data reference potential (C)
6	VP	Supplying positive voltage (5 V)
7	--	N/C
8	RxD/TxD-N	Receiving/Sending data (N (A))
9	--	N/C



4.12.2.3 Setting a PROFIBUS Node Address by the Knobs

The address knobs on AHRTU-PFBS-5A are used to set the node address of AHRTU-PFBS-5A on a PROFIBUS-DP network. They are knobs which can be turned. One knob corresponds to $x16^0$, and the other node corresponds to $x16^1$. Setting range: 0~F

Address	Definition
H’1~H’7D	Valid PROFIBUS node address
H’0 or H’7E~H’FF	Invalid PROFIBUS node address



Example: If the node address of AHRTU-PFBS-5A is 26 (decimal value), users have to turn the knob corresponding to $x16^1$ to position 1, and turn the knob corresponding to $x16^0$ to position A.
26 (decimal value) = 1A (hexadecimal value)=$1\times16^1 + A\times16^0$

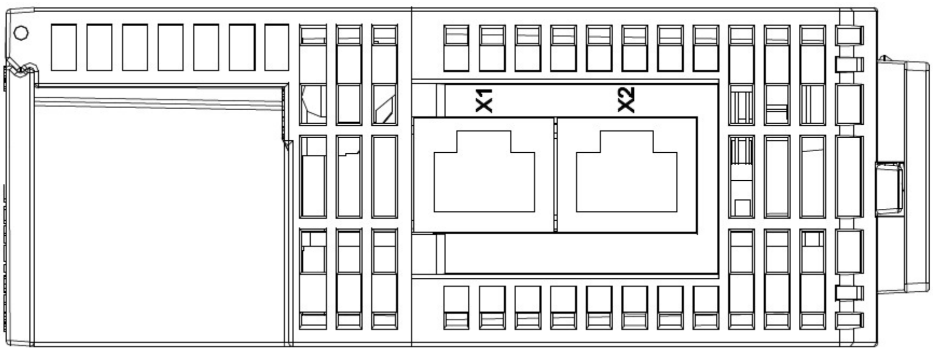
Points for attention:

- If users set the node address of AHRTU-PFBS-5A when AHRTU-PFBS-5A is not supplied with power, they have to power AHRTU-PFBS-5A after the node address of AHRTU-PFBS-5A is set.
- If users change the node address of AHRTU-PFBS-5A when AHRTU-PFBS-5A is powered, the change will not take effect immediately after the node address of AHRTU-PFBS-5A is changed, and it will take effect after the users cut off the power supplied to AHRTU-PFBS-5A and then power AHRTU-PFBS-5A again.
- To prevent the address knobs on AHRTU-PFBS-5A from being scratched, please carefully use a slotted screwdriver to rotate the address knobs on AHRTU-PFBS-5A.

4.12.3 Wiring AHRTU0-ETHN-5A

4.12.3.1 Connecting the Ethernet

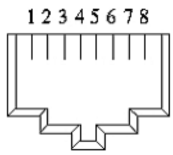
Connect the network cable CAT 5e to the RJ-45 port X1 or X2 of the AHRTU-ETHN-5A. After the CAT 5e is connected to the RJ-45 port of the AHRTU-ETHN-5A, the corresponding lights of RJ-45 port X1 or X2 will be ON. When the linear topology is employed, users can use the RJ-45 port X1 or X2 for establishing connections to other devices and no Ethernet switch is needed.



Note: when using port X1 or X2 to make a connection, do not create a loop; otherwise the communication between devices will fail.

4.12.3.2 Ethernet

Ethernet port

Pin	Definition	Description	RJ-45
1	TX+	Transmitting data (positive pole)	
2	TX-	Transmitting data (negative pole)	
3	RX+	Receiving data (positive pole)	
4	-	-	
5	-	-	
6	RX-	Receiving data (negative pole)	
7	-	-	
8	-	-	

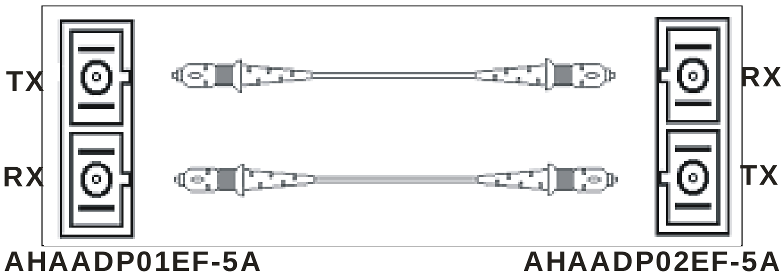
4.12.3.3 IP Address Knobs

The IP address of the AHRTU-ETHN-5A series can be set via the address knobs; the default address range is 192.168.1.x and x should be set from 00 to FF.

Address	Description	
00 ~ 0xFD	1. Valid IP address: 192.168.1.x, x = 1 ~ FD, (1~253) 2. 0x00: set up via EIP Builder	
0xFE	Go to the firmware update mode	
0xFF	Restore to factory defaults and reboot to have the defaults to take effect.	

4.12.4 Wiring AHAADP01EF-5A / AHAADP02EF-5A

4.12.4.1 Connecting 100BASE-FX Fibers

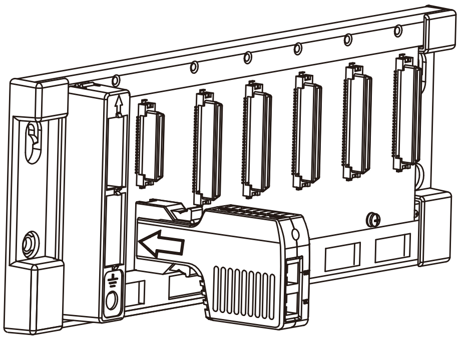


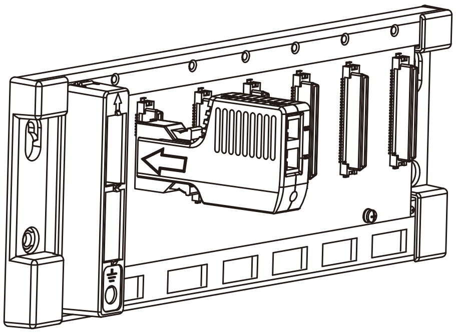
4.12.4.2 Specifications for Cables

- SC, multimode fiber, 62.5/125 μm
- SC, multimode fiber, 50/125 μm

4.12.4.3 Installing AHAADP01EF-5A / AHAADP02EF-5A on a Backplane

The connector of AHAADP01EF-5A must be connected to the lower extension port of a backplane. The connector of AHAADP02EF-5A must be connected to the upper extension port of a backplane.





Points for attention:

- When users install AHAADP01EF-5A/AHAADP02EF-5A on a backplane, they have to make sure that AHAADP01EF-5A/AHAADP02EF-5A is connected to an extension port of the backplane correctly. (AHAADP01EF-5A must be connected to the lower extension port of the backplane, and AHAADP02EF-5A must be connected to the upper extension port of the backplane.) Otherwise, an error will occur if a CPU module connects to AHAADP01EF-5A/AHAADP02EF-5A.

4.13 Wiring Motion Control Modules

4.13.1 Specifications for Motion Control Modules

- **AH02HC-5A**

Item		Specifications
Number of channels		2 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting down (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs) Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	General count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1-
	Signal level	5~24 VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA

- **AH04HC-5A**

Item		Specifications
Number of channels		4 channels
Input signal	**Input (differential input)**	CH0: X0.8+, X0.8-, X0.9+, and X0.9- CH1: X0.10+, X0.10-, X0.11+, and X0.11- CH2: X0.12+, X0.12-, X0.13+, and X0.13- CH3: X0.14+, X0.14-, X0.15+, and X0.15-
	Pulse format	Pulse/Direction (one phase and one input) Counting up/Counting up (one phase and two inputs) One time the frequency of A/B-phase inputs (two phases and two inputs) Four times the frequency of A/B-phase inputs (two phases and two inputs)
	Signal level	5~24 VDC
Specifications	**Maximum frequency of counting**	The maximum frequency is 200 kHz.
	Range	The number of sampled pulses is in the range of -200000 to 200000. The number of accumulated pulses is in the range of -999999999 to 999999999. The number of input pulses is in the range of -2147483648 to 2147483648.
	Type	Linear count Circular count
RESET input	**Input (differential input)**	CH0: X0.0+ and X0.0- CH1: X0.1+ and X0.1- CH2: X0.2+ and X0.2- CH3: X0.3+ and X0.3-
	Signal level	5~24VDC
	Maximum current	15 mA
Comparison output	**Output type**	CH0: The high-speed pulse output Y0.8 is a transistor whose collector is an open collector. CH1: The high-speed pulse output Y0.9 is a transistor whose collector is an open collector. CH2: The high-speed pulse output Y0.10 is a transistor whose collector is an open collector. CH3: The high-speed pulse output Y0.11 is a transistor whose collector is an open collector.
	Signal level	24 VDC
	Maximum current	15 mA

- **AH05PM-5A**

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="3">Specifications</th></tr>
<tr><th colspan="3">AH05PM-5A</th></tr>
<tr><td colspan="2">Number of actual axes</td><td colspan="3">2 axes</td></tr>
<tr><td colspan="2">Storage</td><td colspan="3">The capacity of the built-in storage is 64K steps.</td></tr>
<tr><td colspan="2">Unit</td><td>Motor unit</td><td>Compound unit</td><td>Mechanical unit</td></tr>
<tr><td colspan="2">Connection with a CPU module</td><td colspan="3">Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.</td></tr>
<tr><td colspan="2">Motor control</td><td colspan="3">There are three types of pulse output modes. These modes adopt the differential output.
1. Pulse/Direction
2. Counting up/Counting down
3. A/B-phase output</td></tr>
<tr><td colspan="2">Maximum speed</td><td colspan="3">Single axis: 1M PPS
Multi-axis interpolation: 1M PPS</td></tr>
<tr><td>Input signal</td><td>Detector</td><td colspan="3">X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13</td></tr>
<tr><td>Output signal</td><td>Servo output signal</td><td colspan="3">Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.8, and Y0.9</td></tr>
<tr><td colspan="2">External communication port</td><td colspan="3">Mini USB port</td></tr>
<tr><td colspan="2">Number of basic instructions</td><td colspan="3">27</td></tr>
<tr><td colspan="2">Number of applied instructions</td><td colspan="3">130</td></tr>
<tr><td colspan="2">M-code</td><td colspan="3">1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END))
2. M00~M01, M03~M101, and M103~M65535:
The execution of the program pauses. (WAIT)
Users can use them freely.</td></tr>
<tr><td colspan="2">G-code</td><td colspan="3">G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G90 (absolute programming), and G91 (incremental programming)</td></tr>
</table>

Description of the terminals

<table>
<tr><th rowspan="2">Terminal</th><th rowspan="2">Description</th><th rowspan="2">Response characteristic</th><th colspan="2">Maximum input</th></tr>
<tr><th>Current</th><th>Voltage</th></tr>
<tr><td>X0.0, X0.1, X0.8, X0.9, X0.12, and X0.13</td><td>1. They are single/A/B-phase input terminals.
2. The functions of the terminals:
● Motion control:
◆ X0.0 is the PG input for axis 1, and X0.1 is the PG input for axis 2.
◆ X0.12 is the DOG input for axis 1, and X0.13 is the DOG input for axis 2.
◆ X0.8 and X0.9 are for a manual pulse generator.
● High-speed count:
◆ X0.0 is the RESET input for counter 0.
◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0.
● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches.</td><td>100 kHz (*1)</td><td>15 mA</td><td>24 V</td></tr>
</table>

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
	● Interrupt input terminals: X0.8, X0.9, X0.12, X0.13			
Y0.8 and Y0.9	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: Y0.8 is the CLEAR output for axis 1, and Y0.9 is the CLEAR output for axis 2. ● High-speed comparison and catch: The high-speed comparison output terminals provide the PWM function.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, and Y0.3-	1. They are differential output terminals. 2. The function of the terminals: ● Motion control: ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase output terminals for axis 2. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

● **AH10PM-5A**

Item		Specifications		
		AH10PM-5A		
Number of actual axes		6 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		There are three types of pulse output modes. These modes adopt the differential output. 1. Pulse/Direction 2. Counting up/Counting down 3. A/B-phase output		
Maximum speed		Single axis: 1M PPS Multi-axis interpolation: 1M PPS		
Input signal	Operating switch	STOP/RUN (automatic/manual switch)		
	Detector	X0.8, X0.9, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-		
Output signal	Servo output signal	Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, and Y0.11		
External communication port		Mini USB port Ethernet port		
Expansion storage device		Mini SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		

Item	Specifications
	AH10PM-5A
M-code	1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) 2. M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) Users can use them freely.
G-code	G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)

Description of the terminals

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input terminals for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches.	200 kHz	15 mA	5~24 V
X0.8 and X0.9	1. They are single/A/B-phase input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8 is the A-phase input for counter 0, and X0.9 is the B-phase input for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	100 kHz (*1)	15 mA	24 V
X0.10, X0.11, X0.12, X0.13, X0.14, and X0.15	1 They are single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 6. ● High-speed counter: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1, X0.12 is the A-phase input for counter 2 and counter 4, and X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11 is the B-phase input for counter 1, X0.13 is the B-phase input for counter 2	100 kHz (*1)	15 mA	24 V

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
	and counter 4, and X0.15 is the B-phase input for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals			
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The functions of the terminals: ● Motion control: ◆ The terminals are the CLEAR output terminals for axis 1~axis 4, and provide the PWM function. ◆ Y0.8 and Y0.9 are for axis 5. Y0.10 and Y0.11 are for axis 6. Y0.8 is the A-phase output for axis 5, and Y0.10 is the A-phase output for axis 6. Y0.9 is the B-phase output for axis 5, and Y0.11 is the B-phase output for axis 6. ● High-speed comparison and catch: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. They are differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output terminals for axis 6.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH15PM-5A**

<table>
<tr><th colspan="2">Item</th><th colspan="3">AH15PM-5A</th></tr>
<tr><td colspan="2">Number of actual axes</td><td colspan="3">4 axes</td></tr>
<tr><td colspan="2">Storage</td><td colspan="3">The capacity of the built-in storage is 64K steps.</td></tr>
<tr><td colspan="2">Unit</td><td>Motor unit</td><td>Compound unit</td><td>Mechanical unit</td></tr>
<tr><td colspan="2">Connection with a CPU module</td><td colspan="3">Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.</td></tr>
<tr><td colspan="2">Motor control</td><td colspan="3">There are three types of pulse output modes. These modes adopt the differential output.
1. Pulse/Direction
2. Counting up/Counting down
3. A/B-phase output</td></tr>
<tr><td colspan="2">Maximum speed</td><td colspan="3">Single axis: 1M PPS
Multi-axis interpolation: 1M PPS</td></tr>
<tr><td rowspan="2">Input signal</td><td>Operating switch</td><td colspan="3">STOP/RUN (automatic/manual switch)</td></tr>
<tr><td>Detector</td><td colspan="3">X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-, X0.4, X0.5, X0.6, X0.7, X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, X1.1, X1.2, X1.3, X1.4, X1.5</td></tr>
<tr><td>Output signal</td><td>Servo output signal</td><td colspan="3">Y0.0+, Y0.0-, Y0.2+, Y0.2-, Y0.4+, Y0.4-, Y0.6+, Y0.6-, Y0.1+, Y0.1-, Y0.3+, Y0.3-, Y0.5+, Y0.5-, Y0.7+, Y0.7-, Y0.8, Y0.9, Y0.10, and Y0.11</td></tr>
<tr><td colspan="2">External communication port</td><td colspan="3">Mini USB port
Ethernet port</td></tr>
<tr><td colspan="2">Expansion storage device</td><td colspan="3">Mini SD card
The maximum capacity is 32 GB.</td></tr>
<tr><td colspan="2">Number of basic instructions</td><td colspan="3">27</td></tr>
<tr><td colspan="2">Number of applied instructions</td><td colspan="3">130</td></tr>
<tr><td colspan="2">M-code</td><td colspan="3">1. OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END))
2. M00~M01, M03~M101, and M103~M65535:
The execution of the program pauses. (WAIT)
Users can use them freely.</td></tr>
<tr><td colspan="2">G-code</td><td colspan="3">G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)</td></tr>
</table>

Description of the terminals

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: They are the PG input terminals for axis 1~axis 4. ● High-speed counter: X0.0+ and X0.0- are the RESET input terminals for counter 0. X0.1+ and X0.1- are the RESET input terminals for counter 1. X0.2+ and X0.2- are the RESET input terminals for counter 2 and counter 4. X0.3+ and X0.3- are the RESET input terminals for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V
X0.4, X0.5, X0.6, and X0.7	1 They are single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: They are the DOG input terminals for axis 1~axis 4.	100 kHz (*1)	15 mA	24 V
X0.8+, X0.8-, X0.9+, and X0.9-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0, and X0.9+ and X0.9- are the B-phase input terminals for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V
X0.10, X0.11, X0.12, X0.13, X0.14, X0.15, X1.0, and X1.1	1 They are single/A/B-phase input terminals. 2 The functions of the terminals: ● Motion control: X0.10 is LSP0, X0.11 is LSN0, X0.12 is LSP1, X0.13 is LSN1, X0.14 is LSP2, X0.15 is LSN2, X1.0 is LSP3, and X1.1 is LSN3. ● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ X0.10 is the A-phase input for counter 1. X0.12 is the A-phase input for counter 2 and counter 4. X0.14 is the A-phase input for counter 3 and counter 5. ◆ X0.11is the B-phase input for counter 1. X0.13 is the B-phase input for counter 2 and counter 4. X0.15 is the B-phase input for counter 3 and counter 5.	100 kHz (*1)	15 mA	24 V

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
	● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals: X0.10~X0.15			
X1.2, X1.3, X1.4, and X1.5	1. They are single/A/B-phase input terminals.	100 kHz (*1)	15 mA	24 V
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collector. 2. The function of the terminals: ● Motion control: The terminals are the CLEAR output terminals for axis 1~axis 4. ● High-speed comparison and catch: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V
Y0.0+, Y0.0-, Y0.1+, Y0.1-, Y0.2+, Y0.2-, Y0.3+, Y0.3-, Y0.4+, Y0.4-, Y0.5+, Y0.5-, Y0.6+, Y0.6-, Y0.7+, and Y0.7-	1. They are differential output terminals. 2. The function of the terminals: ● Motion control: ◆ The terminals are for axis 1~axis 4. ◆ Y0.0+ and Y0.0- are the A-phase output terminals for axis 1. Y0.2+ and Y0.2- are the A-phase the output terminals for axis 2. Y0.4+ and Y0.4- are the A-phase output terminals for axis 3. Y0.6+ and Y0.6- are the A-phase output terminals for axis 4. ◆ Y0.1+ and Y0.1- are the B-phase output terminals for axis 1. Y0.3+ and Y0.3- are the B-phase output terminals for axis 2. Y0.5+ and Y0.5- are the B-phase output terminals for axis 3. Y0.7+ and Y0.7- are the B-phase output terminals for axis 4. ◆ Y0.0+ and Y0.0- are the CLEAR output terminals for axis 5. Y0.1+ and Y0.1- are the CLEAR output terminals for axis 6.	1 MHz	5 mA	5 V

*1. If the frequency of input signals received by an input terminal must be 200 kHz, the input terminal must be connected to a 1 kΩ (2 W) resistor in parallel.

- **AH20MC-5A**

Item		Specifications		
		AH20MC-5A		
Number of actual axes		12 axes		
Storage		The capacity of the built-in storage is 64K steps.		
Unit		Motor unit	Compound unit	Mechanical unit
Connection with a CPU module		Users can set the initial register involved in the data exchange in a CPU module, and the number of registers involved in the data exchange in the CPU module. Four hundred data registers at most can be involved in the data exchange.		
Motor control		Delta high-speed motion control system DMCNET (Delta Motion Control Network) The response time is one millisecond.		
Maximum speed		Single axis: 1M PPS Two-axis interpolation: 1M PPS		
Input signal	**Operating switch**	STOP/RUN (automatic/manual switch)		
	Detector	X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13-, X0.14+, X0.14-, X0.15+, X0.15, X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, X0.3-, X0.8+, X0.8-, X0.9+, X0.9-		
Output signal	**Servo output signal**	Y0.8, Y0.9, Y0.10, Y0.11		
External communication port		Mini USB port Ethernet port DMCNET port		
Expansion storage device		Mini SD card The maximum capacity is 32 GB.		
Number of basic instructions		27		
Number of applied instructions		130		
M-code		● OX0~OX99 (motion subroutine/positioning program): M02 (The execution of the program stops. (END)) ● M00~M01, M03~M101, and M103~M65535: The execution of the program pauses. (WAIT) Users can use them freely.		
G-code		G0 (rapid positioning), G1 (linear interpolation), G2 (circular interpolation, clockwise), G3 (circular interpolation, counterclockwise), G4 (dwell), G17 (XY plane selection), G18 (ZX plane selection), G19 (YZ plane selection), G90 (absolute programming), and G91 (incremental programming)		

Description of the terminals

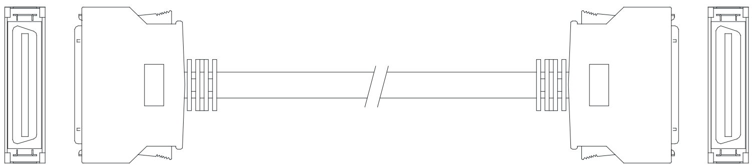
Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
X0.0+, X0.0-, X0.1+, X0.1-, X0.2+, X0.2-, X0.3+, and X0.3-	1. They are differential input terminals. 2. The functions of the terminals: ● High-speed count: ◆ The terminals are the RESET input terminals for counter 0~counter 5. ◆ X0.0+ and X0.0- are for counter 0. X0.1+ and X0.1- are for counter 1. X0.2+ and X0.2- are for counter 2 and counter 4. X0.3+ and X0.3- are for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches.	200 kHz	15 mA	5~24 V
X0.8+, X0.8-, X0.9+, and X0.9-	1. They are differential input terminals. 2. The functions of the terminals: ● Motion control: The terminals are for a manual pulse generator. ● High-speed count: ◆ The terminals are for counter 0. ◆ X0.8+ and X0.8- are the A-phase input terminals for counter 0. X0.9+ and X0.9- are the B-phase input temrinals for counter 0. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V
X0.10+, X0.10-, X0.11+, X0.11-, X0.12+, X0.12-, X0.13+, X0.13, X0.14+, X0.14-, X0.15+, and X0.15-	1. They are differential input terminals. 2. The functions of the terminals: Motion Control: Axis1~6 Dog pulse inputs, applicable for single axis input motion control ● High-speed count: ◆ The terminals are for counter 1~counter 5. ◆ X0.10+ and X0.10- are the A-phase input terminals for counter 1. X0.12+ and X0.12- are the A-phase input terminals for counter 2 and counter 4. X0.14+ and X0.14- are the A-phase input terminals for counter 3 and counter 5. ◆ X0.11+ and X0.11- are the B-phase input terminals for counter 1. X0.13+ and X0.13- are the B-phase input terminals for counter 2 and counter 4. X0.15+ and X0.15- are the B-phase input terminals for counter 3 and counter 5. ● High-speed comparison and catch: The terminals can function as trigger signals for high-speed catches. ● Interrupt input terminals	200 kHz	15 mA	5~24 V

Terminal	Description	Response characteristic	Maximum input	
			Current	Voltage
Y0.8, Y0.9, Y0.10, and Y0.11	1. The high-speed pulse output terminals are transistors whose collectors are open collectors. 2. The function of the terminals: ● High-speed comparison and catch: The terminals can function as high-speed comparison output terminals.	200 kHz	15 mA	24 V

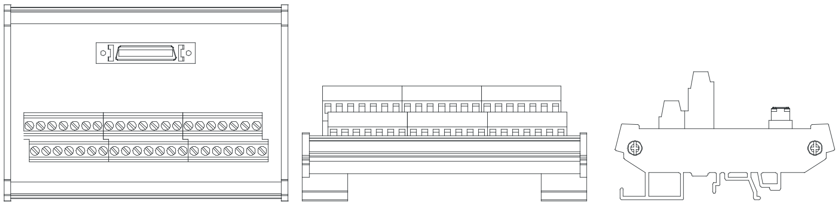
4.13.2 I/O Extension Cables and External Terminal Modules

A connector for a motion control module connects an I/O extension cable to an external terminal module. Users can install wires on the input and output terminal blocks in the external terminal module.

1. I/O extension cable UC-ET010-13B/UC-ET010-15B
   UC-ET010-13B is a 36-pin I/O extension cable for AH04HC-5A and AH20MC-5A.
   UC-ET010-15B is a 50-pin I/O extension cable for AH10PM-5A.

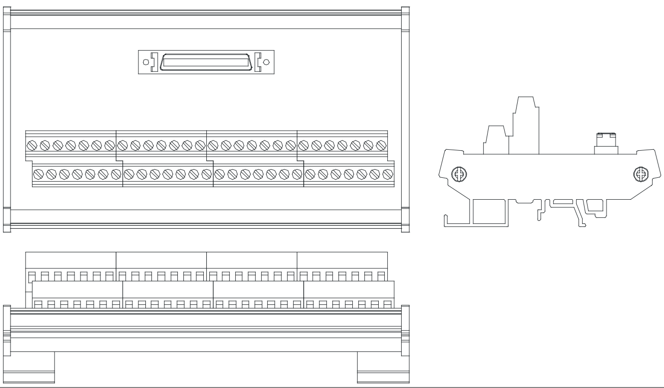


2. External terminal module for AH04HC-5A and AH20MC-5A: UB-10-IO16C



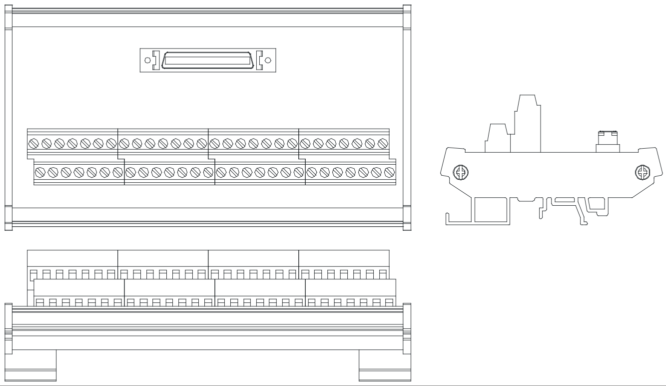
C3	C2	C1	C0	N/C	N/C	X0.3-	X0.15-	X0.14-	X0.2-	X0.13-	X0.12-	X0.1-	X0.11-	X0.10-	X0.0-	X0.9-	X0.8-	24G	24G	FE
Y0.11	Y0.10	Y0.9	Y0.8	N/C	N/C	X0.3+	X0.15+	X0.14+	X0.2+	X0.13+	X0.12+	X0.1+	X0.11+	X0.10+	X0.0+	X0.9+	X0.8+	N/C	24V	24V

3. External terminal module for AH10PM-5A: UB-10-IO24C



1st from the upper left	C3	C2	C1	C0	N/C	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	N/C
15th from the upper left	N/C	X0.15	X0.13	X0.11	X0.9	N/C	N/C	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.11	Y0.10	Y0.9	Y0.8	N/C	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	N/C
15th from the lower left	S/S	X0.14	X0.12	X0.10	X0.8	N/C	N/C	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

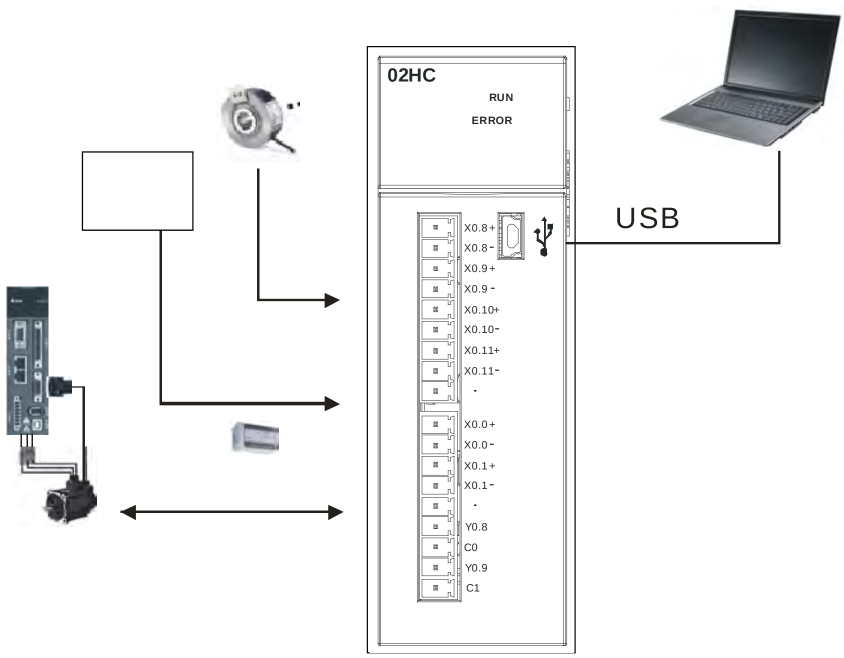
4. External terminal module for AH15PM-5A: UB-10-IO34C



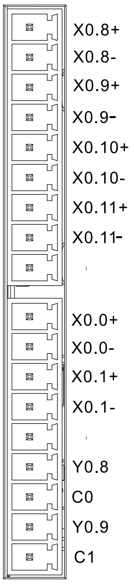
1st from the upper left	Y0.11	Y0.9	COM	Y0.7-	Y0.6-	Y0.5-	Y0.4-	Y0.3-	Y0.2-	Y0.1-	Y0.0-	X1.5	X1.3	X1.1
15th from the upper left	X0.15	X0.13	X0.11	X0.9-	X0.8-	X0.7	X0.5	X0.3-	X0.2-	X0.1-	X0.0-	24G	24G	FE
1st from the lower left	Y0.10	Y0.8	Y0.7+	Y0.6+	Y0.5+	Y0.4+	Y0.3+	Y0.2+	Y0.1+	Y0.0+	S/S	Y1.4	Y1.2	Y1.0
15th from the lower left	X0.14	X0.12	X0.10	X0.9+	X0.8+	X0.6	X0.4	X0.3+	X0.2+	X0.1+	X0.0+	N/C	24V	24V

4.13.3 Wiring AH02HC-5A and AH04HC-5A

- External devices for AH02HC-5A

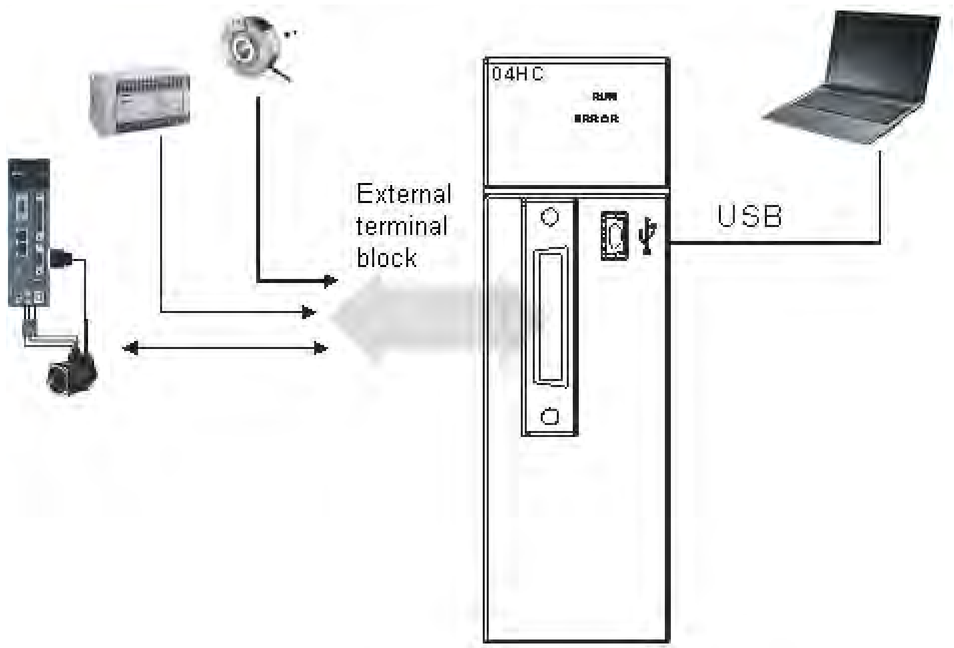


- Terminals on AH02HC-5A

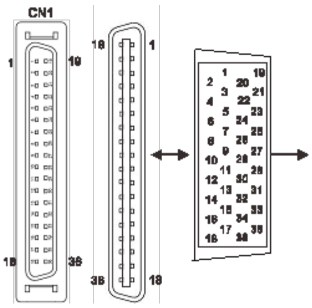


Terminal	Function	Terminal	Function
	Count		Count
X0.8+	CntA0+	X0.0+	Rst0+
X0.8-	CntA0-	X0.0-	Rst0-
X0.9+	CntB0+	X0.1+	Rst1+
X0.9-	CntB0-	X0.1-	Rst1-
X0.10+	CntA1+	Y0.8	Out0
X0.10-	CntA1-	C0	COM0
X0.11+	CntB1+	Y0.9	Out1
X0.11-	CntB1-	C1	COM1

- External devices for AH04HC-5A



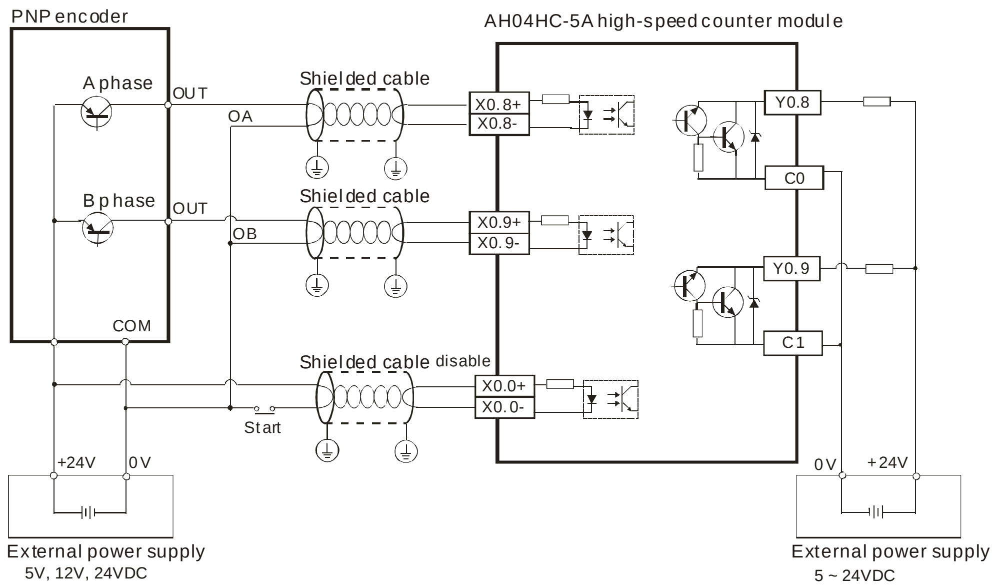
- Connector on AH04HC-5A



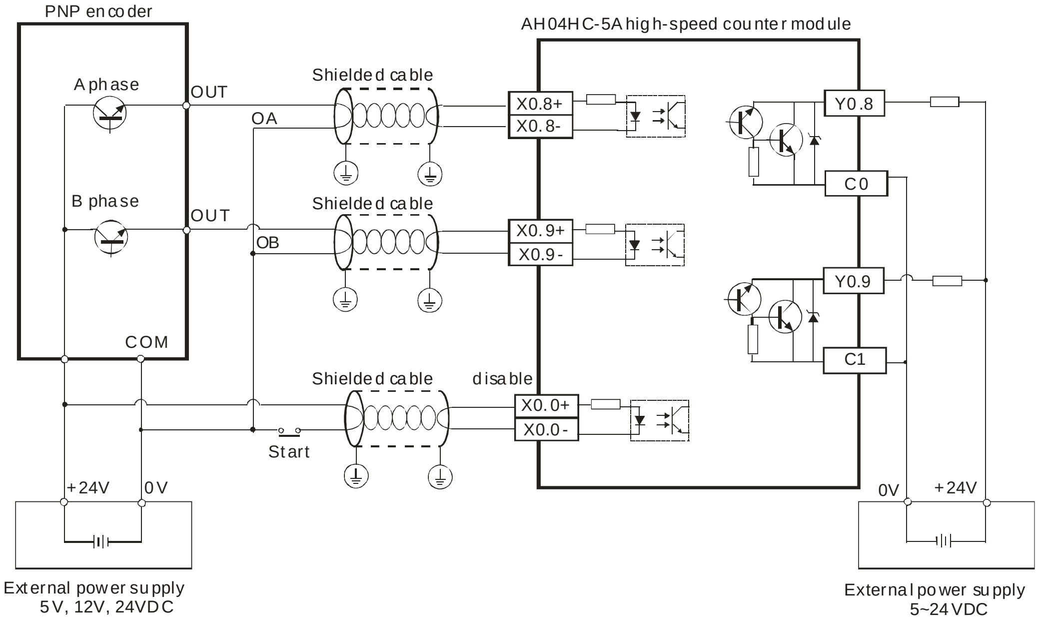
Pin	Terminal	Function Count	Pin	Terminal	Function Count
1	C3	COM3	2	Y0.11	Out3
3	C2	COM2	4	Y0.10	Out2
5	C1	COM1	6	Y0.9	Out1
7	C0	COM0	8	Y0.8	Out0
9	-	-	10	-	-
11	-	-	12	-	-
13	X0.3-	Rst3-	14	X0.3+	Rst3+
15	X0.15-	CntB3-	16	X0.15+	CntB3+
17	X0.14-	CntA3-	18	X0.14+	CntA3+
19	X0.2-	Rst2-	20	X0.2+	Rst2+
21	X0.13-	CntB2-	22	X0.13+	CntB2+
23	X0.12-	CntA2-	24	X0.12+	CntA2+
25	X0.1-	Rst1-	26	X0.1+	Rst1+
27	X0.11-	CntB1-	28	X0.11+	CntB1+
29	X0.10-	CntA1-	30	X0.10+	CntA1+
31	X0.0-	Rst0-	32	X0.0+	Rst0+
33	X0.9-	CntB0-	34	X0.9+	CntB0+
35	X0.8-	CntA0-	36	X0.8+	CntA0+

4.13.3.1 External Wiring

1. A PNP encoder is used.



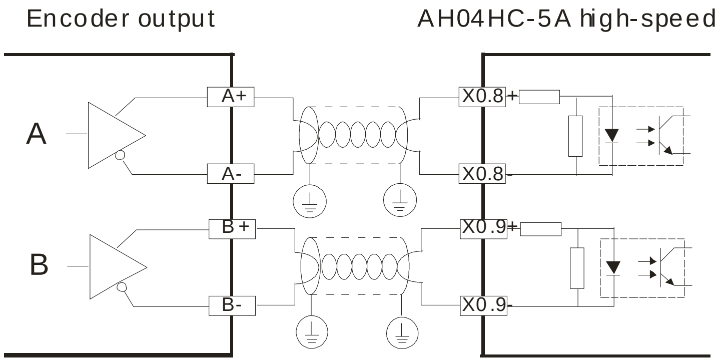
2. An NPN encoder is used.



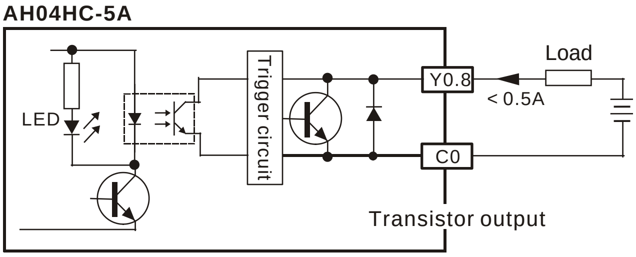
4.13.3.2 Wiring the Differential Input Terminals

The direct-current signals ranging in voltage from 5 V to 24 V can pass through the high-speed input terminals X0.0+~X0.1+, X0.0-~X0.1-, X0.8+~X0.11+, and X0.8-~X0.11- on AH02HC-5A, and the high-speed input terminals X0.0+~X0.3+, X0.0-~X0.3-, X0.8+~X0.15+, and X0.8-~X0.15- on AH04HC-5A. The frequency of input signals can be up to 200 kHz. These high-speed input terminals are connected to a differential (two-wire) line driver.

- Wiring differential input terminals (The wiring below is used for high speed and high noise.)



4.13.3.3 Transistor Output Circuit

<table>
<tr><td colspan="6">
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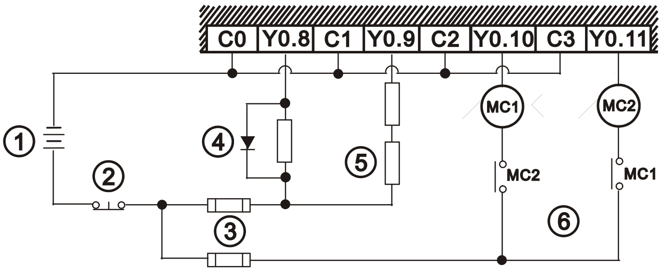
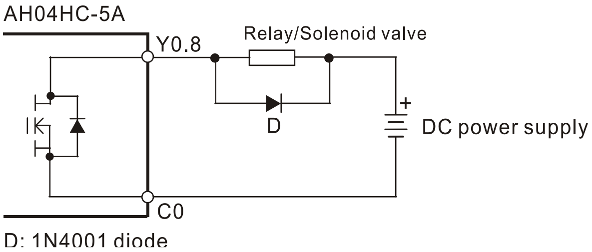
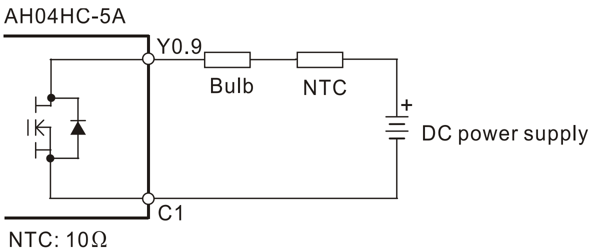
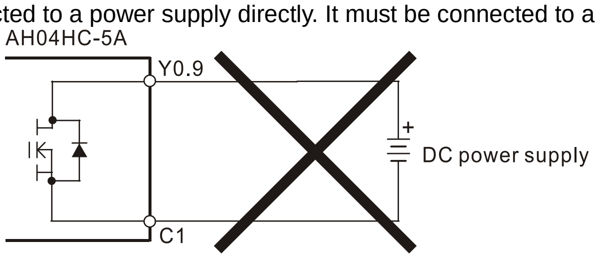
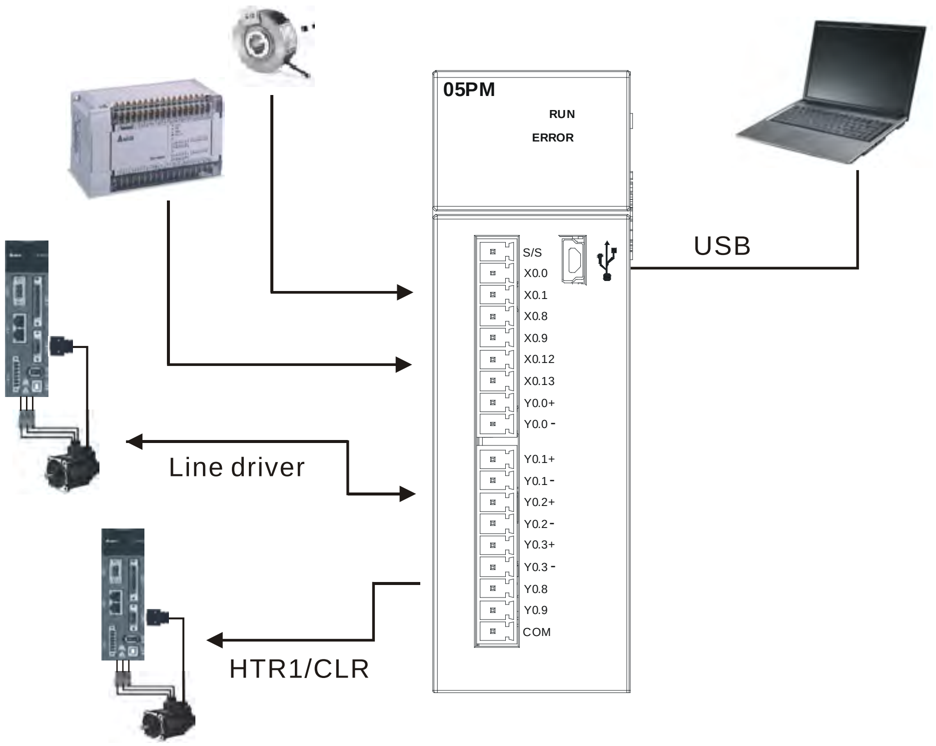
<tr><td colspan="6">
</td></tr>
<tr><td>①</td><td>Direct-current power supply</td><td>②</td><td>Emergency stop</td><td>③</td><td>Fuse</td></tr>
<tr><td>④</td><td colspan="5">The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally.
A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.

</td></tr>
<tr><td>⑤</td><td colspan="5">A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.


Y0.9 can not be connected to a power supply directly. It must be connected to a load.

</td></tr>
</table>

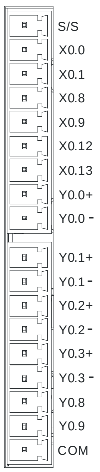
⑥	Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

4.13.4 Wiring AH05PM-5A, AH10PM-5A, and AH15PM-5A

- External devices for AH05PM-5A

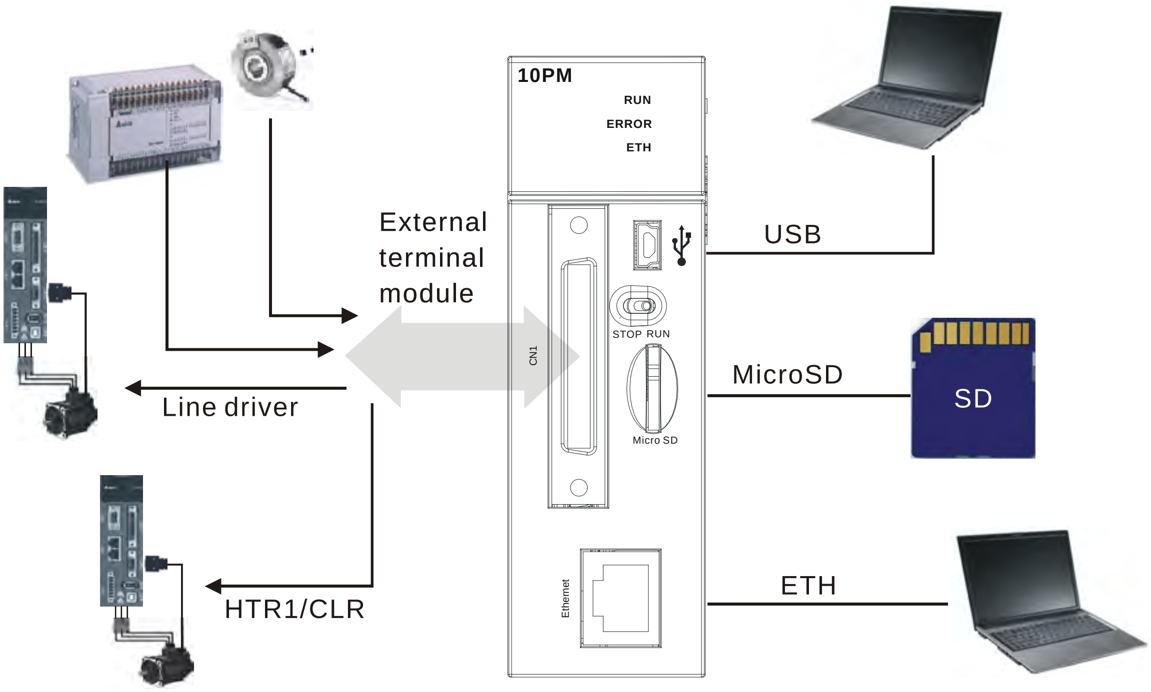


- Terminals on AH05PM-5A

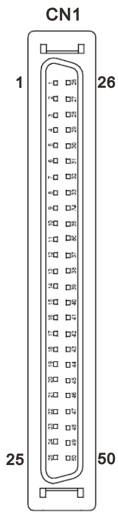


Terminal	Function		Terminal	Function	
	Pulse	Count		Pulse	Count
S/S	S/S	S/S	Y0.1+	B0+	-
X0.0	PG0	Rst0	Y0.1-	B0-	-
X0.1	PG1	-	Y0.2+	A1+	-
X0.8	MPGA	CntA0	Y0.2-	A1-	-
X0.9	MPGB	CntB0	Y0.3+	B1+	-
X0.12	DOG0	-	Y0.3-	B1-	-
X0.13	DOG1	-	Y0.8	CLR0	-
Y0.0+	A0+	-	Y0.9	CLR1	-
Y0.0-	A0-	-	COM	-	-

- External devices for AH10PM-5A

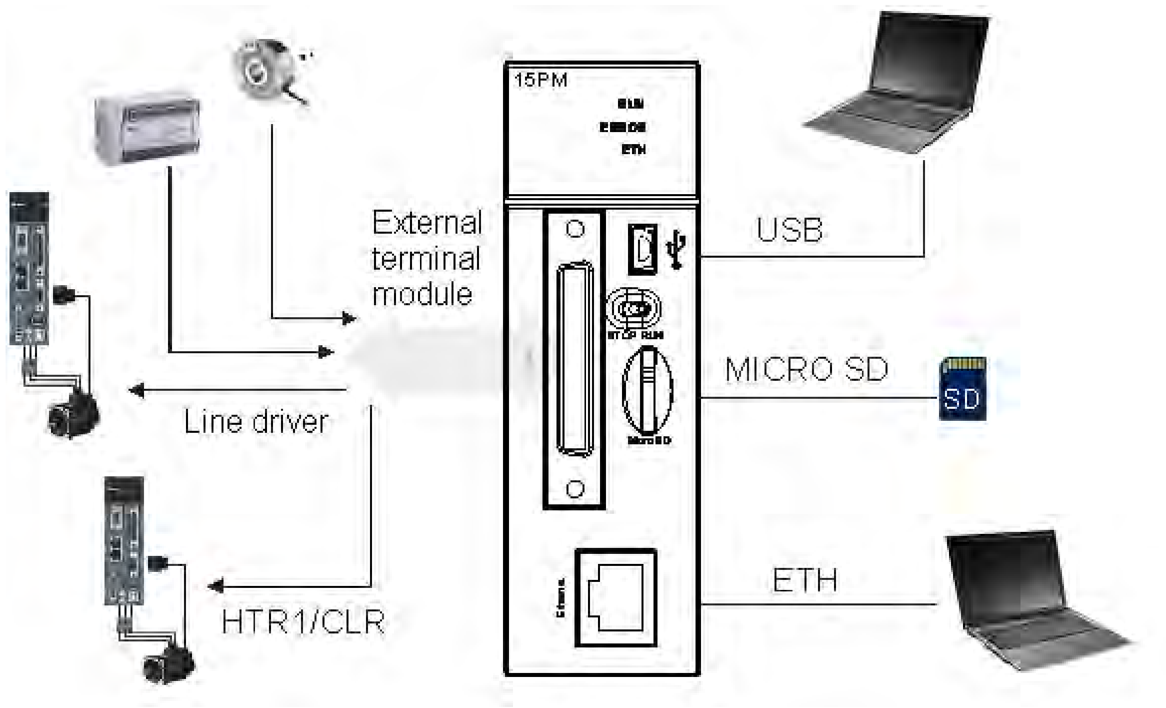


- Connector on AH10PM-5A

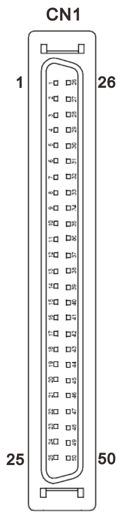


Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	COM3	-	26	Y0.11	CLR3/B5	-
2	C2	COM2	-	27	Y0.10	CLR2/A5	-
3	C1	COM1	-	28	Y0.9	CLR1/B4	-
4	C0	COM0	-	29	Y0.8	CLR0/A4	-
5	NC	-	. -	30	NC	-	-
6	Y0.7-	B3-	-	31	Y0.7+	B3+	-
7	Y0.6-	A3-	-	32	Y0.6+	A3+	-
8	Y0.5-	B2-	-	33	Y0.5+	B2+	-
9	Y0.4-	A2-	-	34	Y0.4+	A2+	-
10	Y0.3-	B1-	-	35	Y0.3+	B1+	-
11	Y0.2-	A1-	-	36	Y0.2+	A1+	-
12	Y0.1-	B0-/CLR5-	-	37	Y0.1+	B0+/CLR5+	-
13	Y0.0-	A0-/CLR4-	-	38	Y0.0+	A0+/CLR4+	-
14	NC	-	-	39	NC	-	-
15	NC	-	-	40	S/S	S/S	S/S
16	X0.15	DOG3	CntB3/CntB5	41	X0.14	DOG2	CntB3/CntA5
17	X0.13	DOG1	CntB2/CntB4	42	X0.12	DOG0	CntA2/CntA4
18	X0.11	DOG5	CntB1	43	X0.10	DOG4	CntA1
19	X0.9	MPGB	CntB0	44	X0.8	MPGA	CntA0
20	NC	-	-	45	NC	-	-
21	NC	-	-	46	NC	-	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

- External devices for AH15PM-5A



- Connector on AH15PM-5A



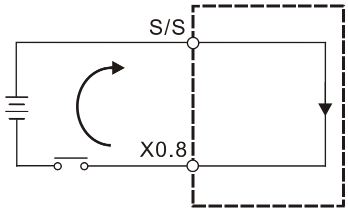
Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	Y0.11	CLR3	-	26	Y0.10	CLR2	-
2	Y0.9	CLR1	-	27	Y0.8	CLR0	-
3	COM	COM	-	28	Y0.7+	B3+	-
4	Y0.7-	B3-	-	29	Y0.6+	A3+	-
5	Y0.6-	A3-	-	30	Y0.5+	B2+	-
6	Y0.5-	B2-	-	31	Y0.4+	A2+	-
7	Y0.4-	A2-	-	32	Y0.3+	B1+	-
8	Y0.3-	B1-	-	33	Y0.2+	A1+	-
9	Y0.2-	A1-	-	34	Y0.1+	B0+	-
10	Y0.1-	B0-	-	35	Y0.0+	A0+	-
11	Y0.0-	A0-	-	36	S/S	S/S	S/S
12	X1.5	CHG3	-	37	X1.4	CHG2	-
13	X1.3	CHG1	-	38	X1.2	CHG0	-
14	X1.1	LSN3	-	39	X1.0	LSP3	-
15	X0.15	LSN2	CntB3/CntB5	40	X0.14	LSP2	CntB3/CntA5
16	X0.13	LSN1	CntB2/CntB4	41	X0.12	LSP1	CntA2/CntA4
17	X0.11	LSN0	CntB1	42	X0.10	LSP0	CntA1
18	X0.9-	MPGB-	CntB0-	43	X0.9+	MPGB+	CntB0+
19	X0.8-	MPGA-	CntA0-	44	X0.8+	MPGA+	CntA0+
20	X0.7	DOG3	-	45	X0.6	DOG2	-
21	X0.5	DOG1	-	46	X0.4	DOG0	-
22	X0.3-	Pg3-	Rst3-/Rst5-	47	X0.3+	Pg3+	Rst3+/Rst5+
23	X0.2-	Pg2-	Rst2-/Rst4-	48	X0.2+	Pg2+	Rst2+/Rst4+
24	X0.1-	Pg1-	Rst1-	49	X0.1+	Pg1+	Rst1+
25	X0.0-	Pg0-	Rst0-	50	X0.0+	Pg0+	Rst0+

4.13.4.1 Wiring Input Terminals

The input signal is the direct-current power input. Sinking and sourcing are the current driving capability of a circuit. They are defined below.

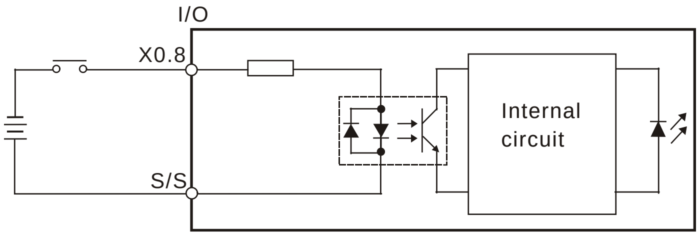
- **Sinking**

Direct current



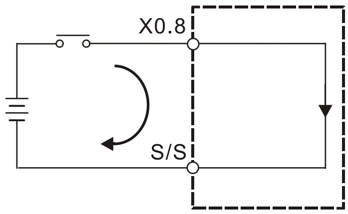
The current flows into the common terminal S/S.

Equivalent circuit of the input circuit



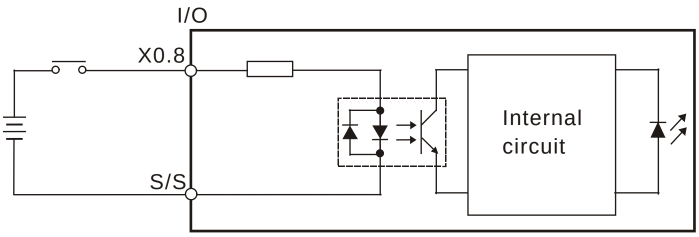
- **Sourcing**

Direct current



The current flows from the common terminal S/S.

Equivalent circuit of the input circuit

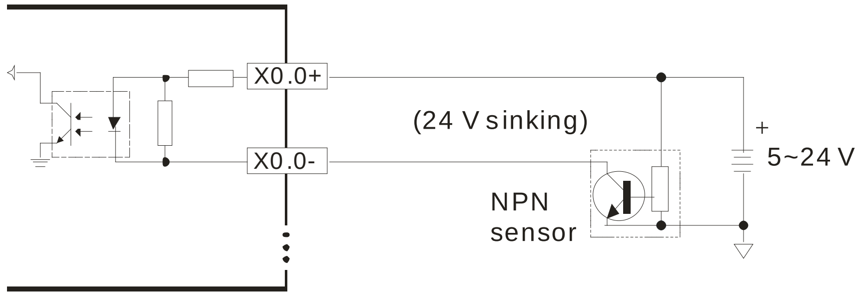


- **Wiring the differential input terminals**

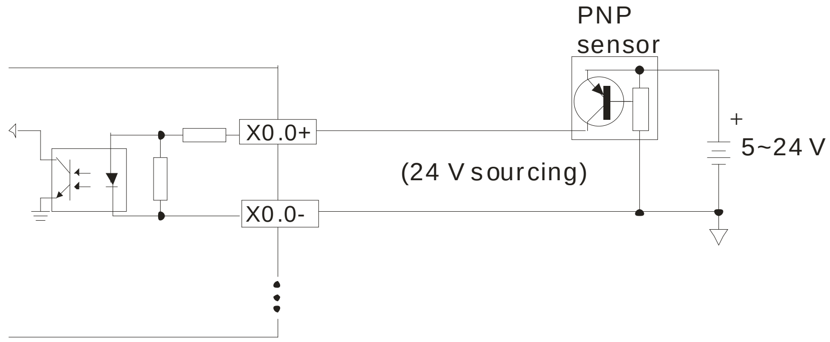
  The direct-current signals ranging in voltage from 5 V to 24 V can pass through the high-speed input terminals X0.0+~X0.3+ and X0.0-~X0.3- on AH10PM-5A, and X0.0+~X0.3+, X0.0-~X0.3-, X0.8+~X0.9+, and X0.8-~X0.9- on AH15PM-5A. (Only 24 VDC signals can pass through the other input terminals on AH10PM-5A and AH15PM-5A.) The frequency of input signals can be up to 200 kHz.

  If the frequency of input signals is less than 50 kHz and there is not much noise, these high-speed input terminals can be connected to the direct-current power supply whose voltage is in the range of 5 V to 24 V. The wiring diagrams for AH10PM-5A are shown below.

Sinking:

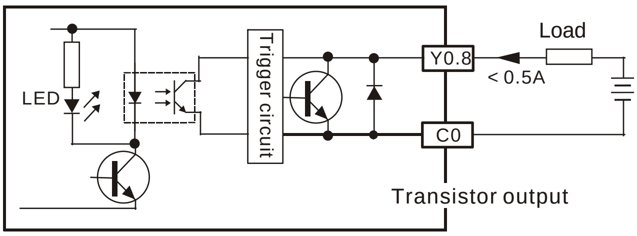


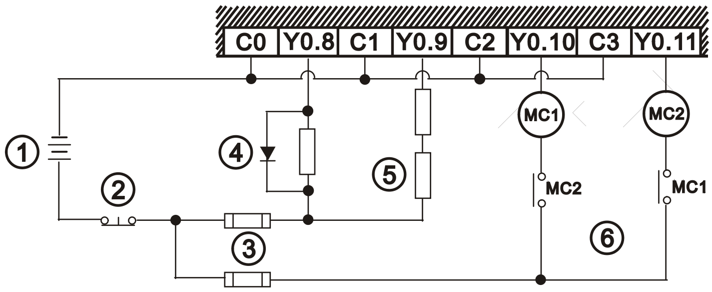
Sourcing:



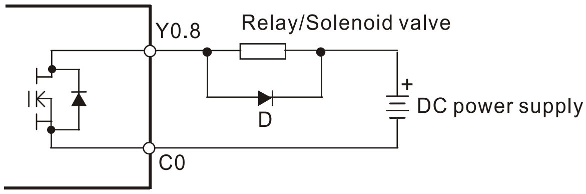
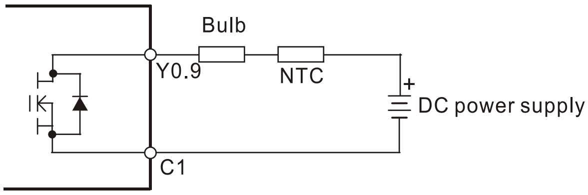
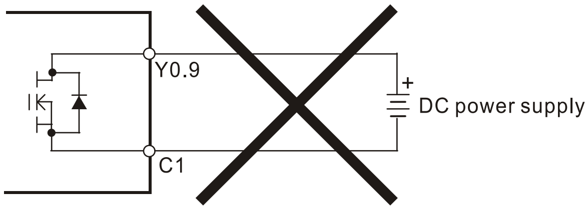
4.13.4.2 Wiring the Output Terminals

1. Transistor output circuit

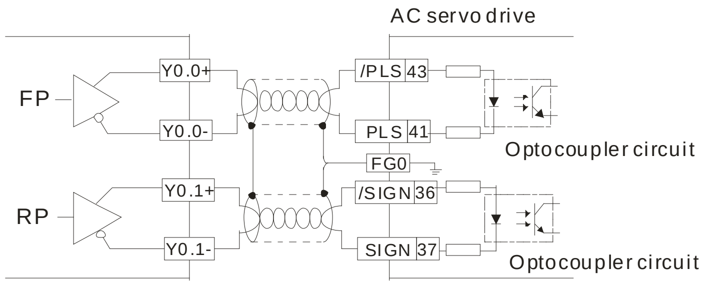




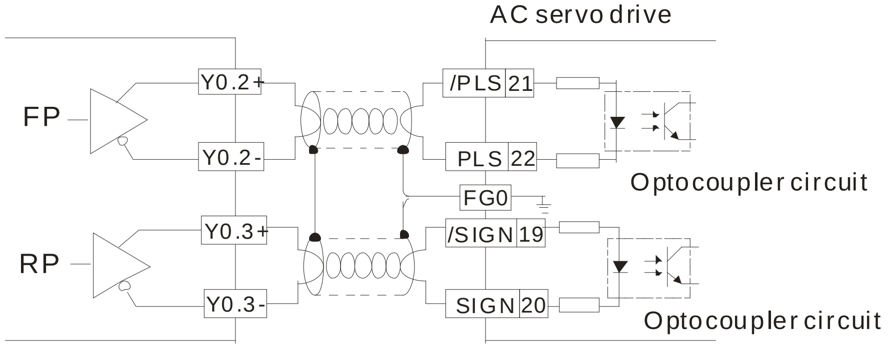
①	Direct-current power supply	②	Emergency stop	③	Fuse

④	The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally. A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.  D: 1N4001 diode
⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  NTC: 10Ω
⑤	Y0.9 can not be connected to a power supply directly. It must be connected to a load. 
⑥	Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

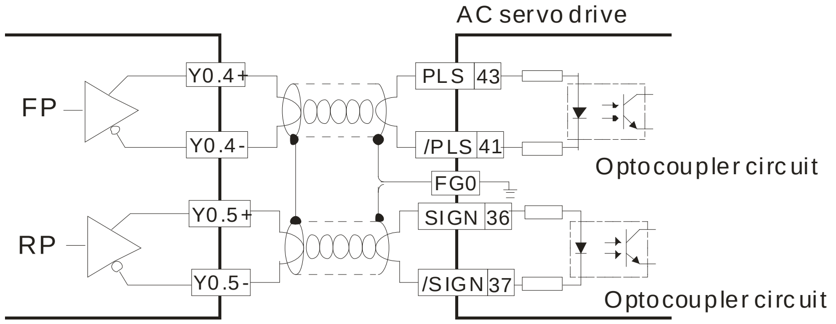
2. Wiring diagrams for the differential output terminals
   - Wiring differential output terminals on AH05PM-5A/AH10PM-5A/AH15PM-5A, and an ASDA-A/ASDA-A+/ASDA-A2 series AC servo drive



- Wiring differential output terminals on AH05PM-5A/AH10PM-5A/AH15PM-5A, and an ASDA-B series AC servo drive

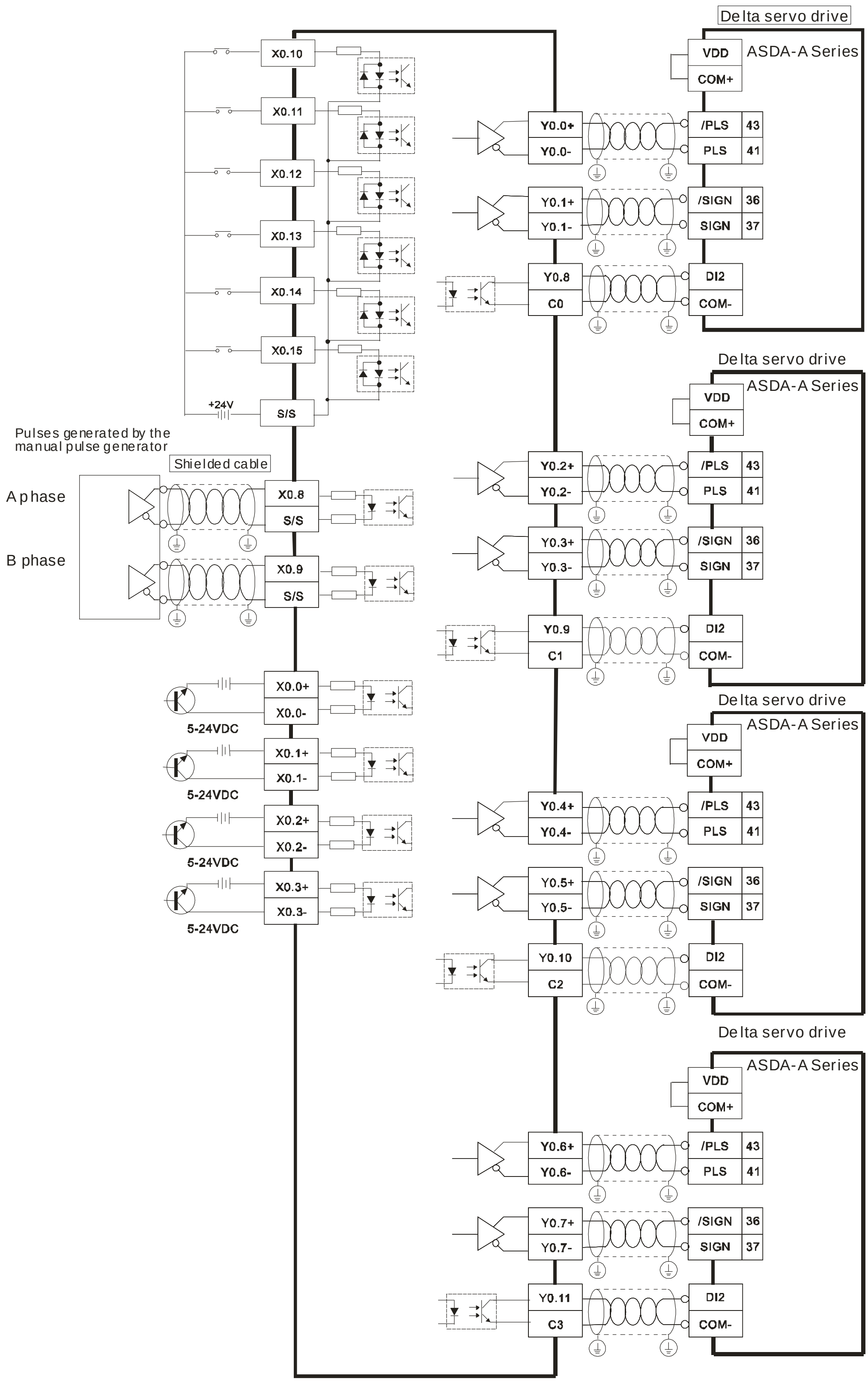


- Wiring differential output terminals on AH05PM-5A/AH10PM-5A/AH15PM-5A, and an ASDA-AB series AC servo drive

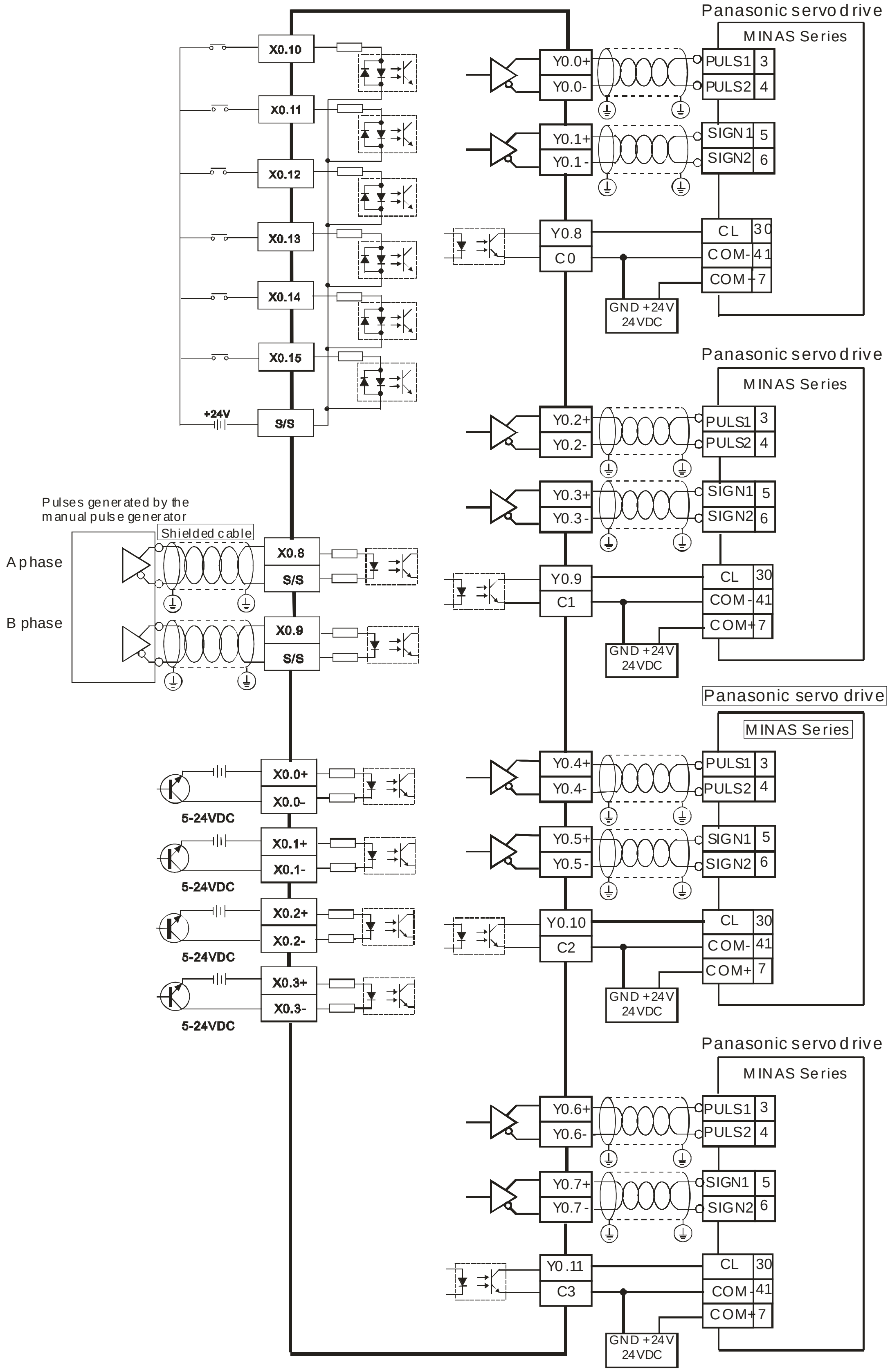


4.13.4.3 Wiring AH10PM-5A and an Inferior Servo Drive

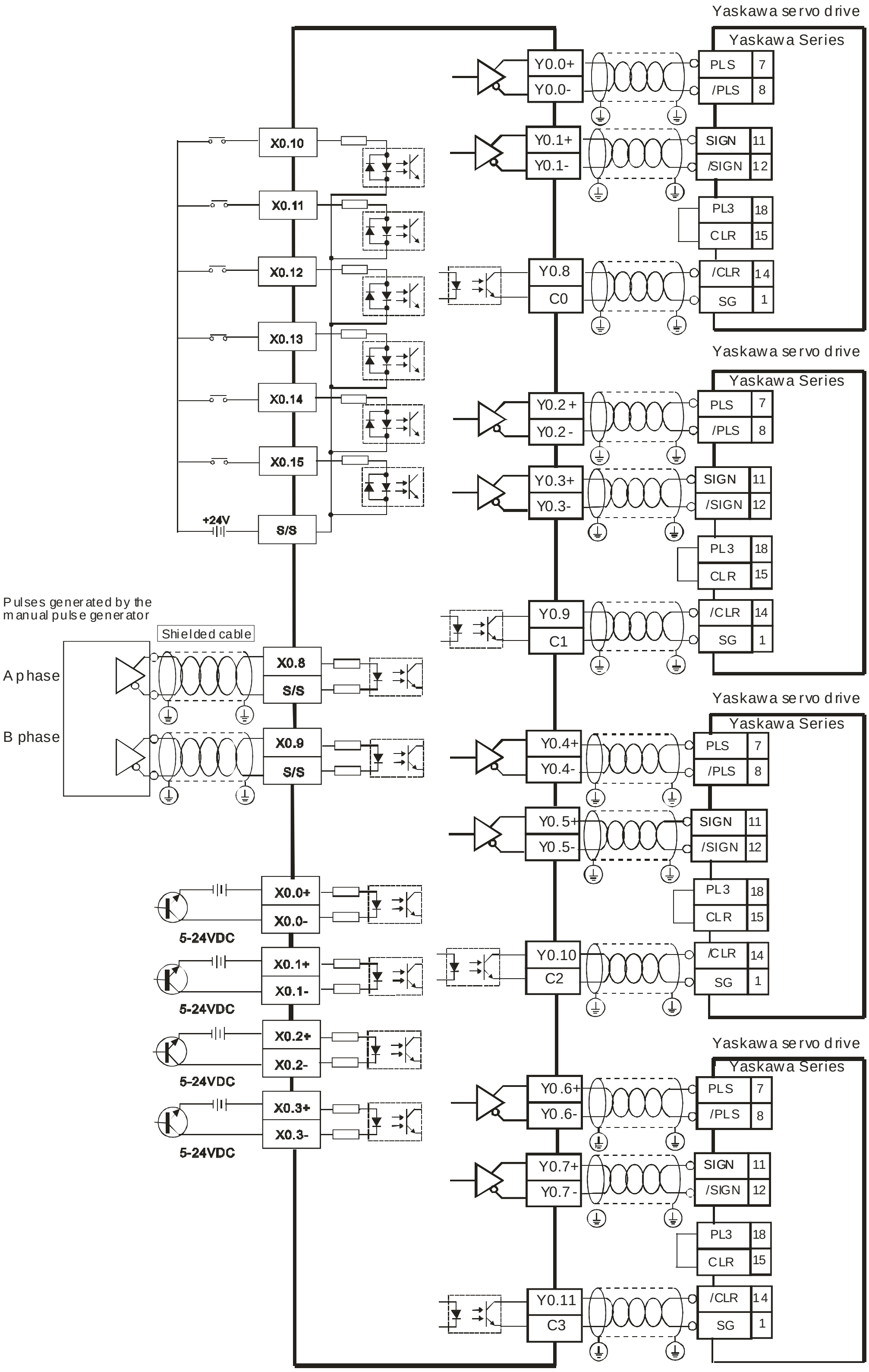
- Wiring AH10PM-5A and a Delta ASDA-A series AC servo drive



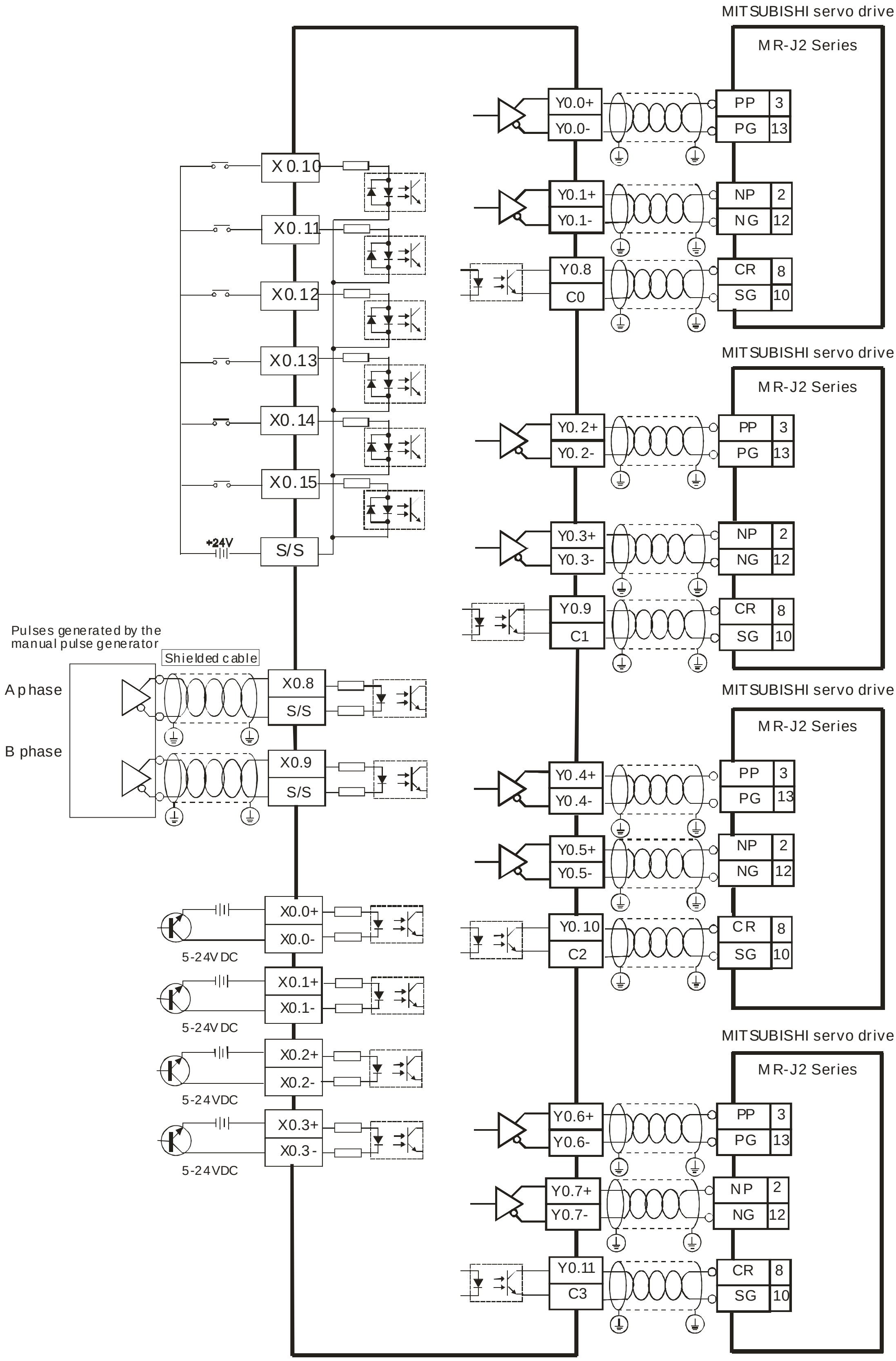
- Wiring AH10PM-5A and a Panasonic MINAS series servo drive



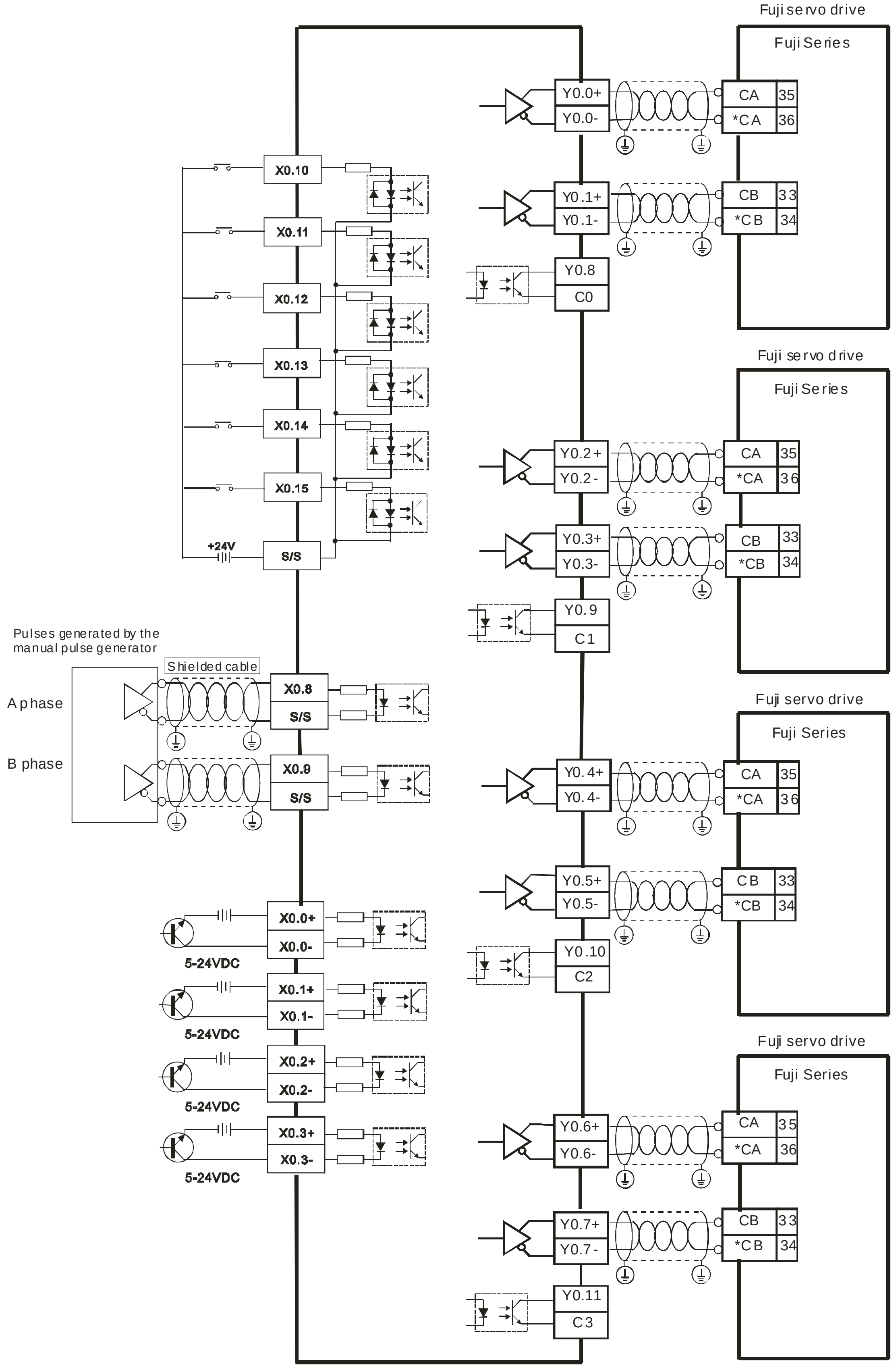
- Wiring AH10PM-5A and an Yaskawa SGDV series servo drive



- Wiring AH10PM-5A and a Mitsubishi MR-J2 series servo drive

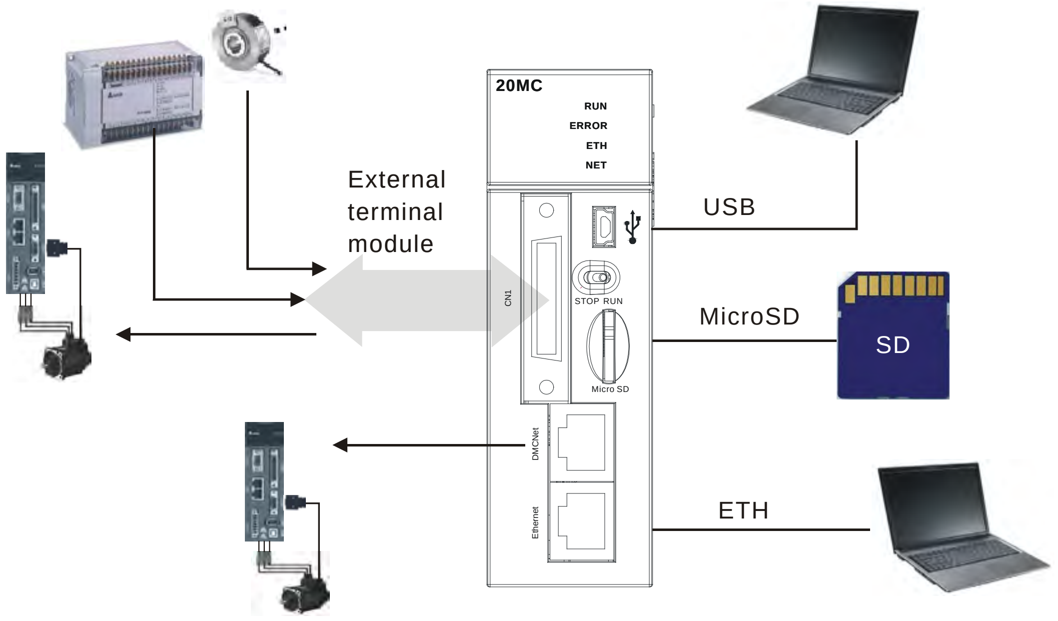


- Wiring AH10PM-5A and a Fuji servo drive

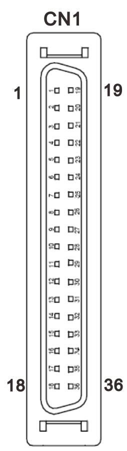


4.13.5 Wiring AH20MC-5A

- External devices for AH20MC-5A



- Connector on AH20MC-5A

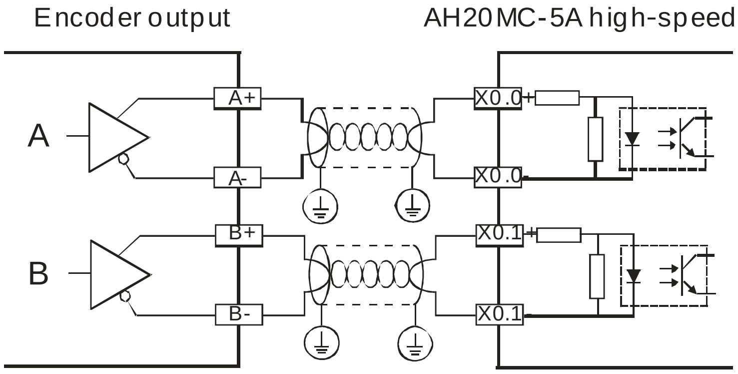


Pin	Terminal	Function		Pin	Terminal	Function	
		Pulse	Count			Pulse	Count
1	C3	-	COM3	19	Y0.11	-	Out3
2	C2	-	COM2	20	Y0.10	-	Out2
3	C1	-	COM1	21	Y0.9	-	Out1
4	C0	-	COM0	22	Y0.8	-	Out0
5	NC	-	-	23	NC	-	-
6	NC	-	-	24	NC	-	-
7	X0.3-	-	Rst3-/Rst5-	25	X0.3+	-	Rst3+/Rst5+
8	X0.15-	DOG3-	CntB3-/CntB5+	26	X0.15+	DOG3+	CntB3+/CntB5+
9	X0.14-	DOG2-	CntA3-/CntA5+	27	X0.14+	DOG2+	CntA3+/CntA5+
10	X0.2-	-	Rst2-/Rst4-	28	X0.2+	-	Rst2+/Rst4+
11	X0.13-	DOG1-	CntB2-/CntB4-	29	X0.13+	DOG1+	CntB2+/CntB4+
12	X0.12-	DOG0-	CntA2-/CntA4-	30	X0.12+	DOG0+	CntA2+/CntA4+
13	X0.1-	-	Rst1-	31	X0.1+	-	Rst1+
14	X0.11-	DOG5-	CntB1-	32	X0.11+	DOG5+	CntB1+
15	X0.10-	DOG4-	CntA1-	33	X0.10+	DOG4+	CntA1+
16	X0.0-	-	Rst0-	34	X0.0+	-	Rst0+
17	X0.9-	MPGB-	CntB0-	35	X0.9+	MPGB+	CntB0+
18	X0.8-	MPGA-	CntA0-	36	X0.8+	MPGA+	CntA0+

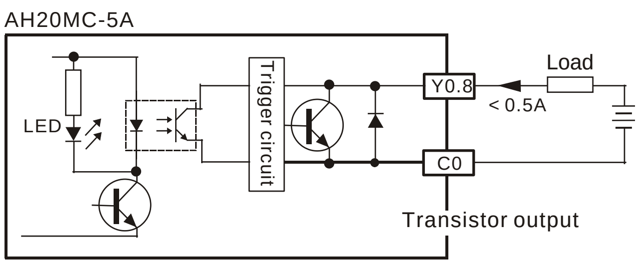
4.13.5.1 Wiring the Differential Input Terminals

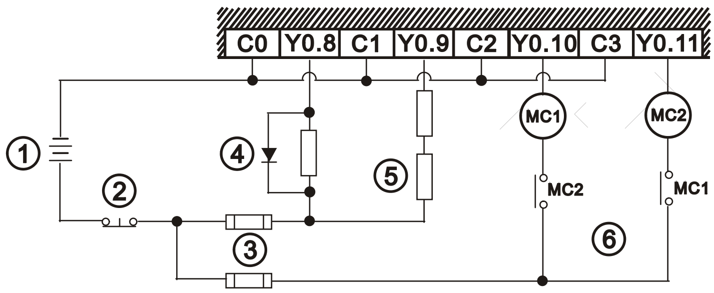
The direct-current signals ranging in voltage from 5 V to 24 V can pass through the high-speed input terminals X0.0+~X0.3+, X0.0-~X0.3-, X0.8+~X0.15+, and X0.8-~X0.15- on AH20MC-5A. The frequency of input signals can be up to 200 kHz. These high-speed input terminals are connected to a differential (two-wire) line driver.

- Wiring differential input terminals (The wiring below is used for high speed and high noise.)

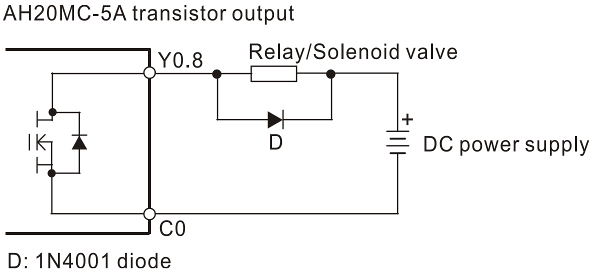


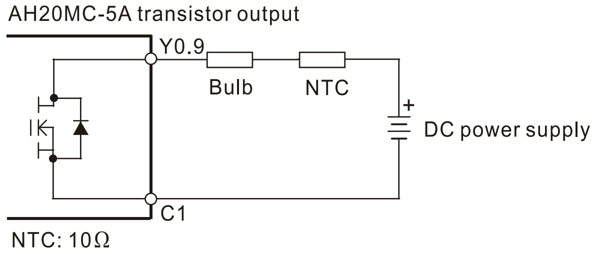
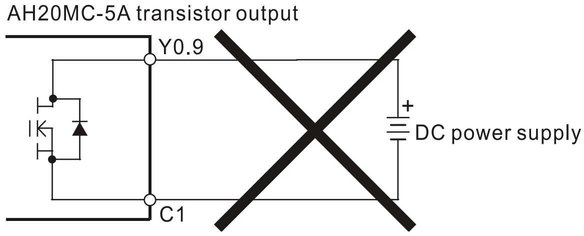
4.13.5.2 Transistor Output Circuit





①	Direct-current power supply	②	Emergency stop	③	Fuse
④	The output terminals of a transistor module are open-collector output terminals. If Y0.8 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally. A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage which occurs when the load is OFF.				



⑤	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  Y0.9 can not be connected to a power supply directly. It must be connected to a load. 
⑥	Mutually exclusive output: For example, Y0.10 controls the clockwise rotation of the motor, and Y0.11 controls the counterclockwise rotation of the motor. The interlock circuit which is formed, and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

Chapter 5 Devices

Table of Contents

5.1 Introduction of Devices

This section gives an account of values/strings processed by the PLC. It also describes the functions of devices which include input/output/auxiliary relays, timers, counters, and data registers.

5.1.1 Devise Table

5.1.1.1 AH500 basic series CPU Modules (AHCPU500/510/520/530)

Type	Device name		Number of devices	Range
Bit device	Input relay	X	1024 (AHCPU500)	X0.0~X63.15
			2048 (AHCPU510)	X0.0~X127.15
			4096 (AHCPU520)	X0.0~X255.15
			8192 (AHCPU530)	X0.0~X511.15
	Output relay	Y	1024 (AHCPU500)	Y0.0~X63.15
			2048 (AHCPU510)	Y0.0~X127.15
			4096 (AHCPU520)	Y0.0~X255.15
			8192 (AHCPU530)	Y0.0~Y511.15
	Data register	D	16384 (AHCPU500)	D0.0~D16383.15
			32768 (AHCPU510)	D0.0~D32767.15
			65536 (AHCPU520/530)	D0.0~D65535.15
	Link register	L	16384 (AHCPU500)	L0.0~D16383.15
			32768 (AHCPU510)	L0.0~D32767.15
			65536 (AHCPU520/530)	L0.0~D65535.15
	Auxiliary relay	M	8192	M0~M8191
	Special auxiliary relay	SM	2048	SM0~SM2047
	Stepping relay	S	2048	S0~S2047
	Timer	T	2048	T0~T2047
	Counter	C	2048	C0~C2047
	32-bit counter	HC	64	HC0~HC63
Word device	Input relay	X	512	X0~X511
	Output relay	Y	512	Y0~Y511
	Data register	D	16384 (AHCPU500)	D0~D16383
			32768 (AHCPU510)	D0~D32767
			65536 (AHCPU520/530)	D0~D65535
	Special data register	SR	2048	SR0~SR2047
	Link register	L	16384 (AHCPU500)	L0~D16383
			32768 (AHCPU510)	L0~D32767
			65536 (AHCPU520/530)	L0~D65535
	Timer	T	2048	T0~T2047
	Counter	C	2048	C0~C2047
	32-bit counter	HC	64 (128 words)	HC0~HC63
	Index register	E	32	E0~E31
Constant*	Decimal system	K	16 bits: -32768~32767 32 bits: -2147483648~2147483647	
	Hexadecimal system	16#	16 bits: 16#0~16#FFFF 32 bits: 16#0~16#FFFFFFFF	
	Single-precision floating-point number	F	32 bits: $\pm1.17549435^{-38}$~$\pm3.40282347^{+38}$	
	Double-precision floating-point number	DF	64 bits: $\pm2.2250738585072014^{-308}$~ $\pm1.7976931348623157^{+308}$	
String*	String	"$"	1~31 characters	

*1: The decimal forms are notated by K in the device lists in Chapter 5 and Chapter 6 in AH500 Programming Manual, whereas K50 should be inputted in ISPSoft rather than merely 50.

*2: The floating-point numbers are notated by F/DF in the device lists in Chapter 5 and Chapter 6 in AH500

Programming Manual, whereas they are represented by decimal points in ISPSoft; for the floating-point F500, one should input 500.0.

*3: The strings are notated by "$" in Chapter 5 and Chapter 6 in AH500 Programming Manual, whereas they are represented by " " in ISPSoft; for the string of 1234, one should input "1234" in ISPSoft.

5.1.1.2 AH500 advanced series CPU Modules (AHCPU501/511/521/531)

Type	Device name		Number of devices	Range
Bit device	Input relay	X	2048 (AHCPU501)	X0.0~X127.15
			4096 (AHCPU511)	X0.0~X255.15
			8192 (AHCPU521)	X0.0~X511.15
			16384 (AHCPU531)	X0.0~X1023.15
	Output relay	Y	2048 (AHCPU501)	Y0.0~Y127.15
			4096 (AHCPU511)	Y0.0~Y255.15
			8192 (AHCPU521)	Y0.0~Y511.15
			16384 (AHCPU531)	Y0.0~Y1023.15
	Data register	D	393216 (AHCPU501)	D0.0~D24575.15
			786432 (AHCPU511)	D0.0~D49151.15
			1572864 (AHCPU521)	D0.0~D98303.15
			2097152 (AHCPU531)	D0.0~D131071.15
	Link register	L	393216 (AHCPU501)	L0.0~L24575.15
			786432 (AHCPU511)	L0.0~L49151.15
			1572864 (AHCPU521)	L0.0~L98303.15
			2097152 (AHCPU531)	L0.0~L131071.15
	Auxiliary relay	M	8192	M0~M8191
	Special auxiliary relay	SM	4096	SM0~SM4095
	Stepping relay	S	2048	S0~S2047
	Timer	T	2048	T0~T2047
	Counter	C	2048	C0~C2047
	32-bit counter	HC	64	HC0~HC63
Word device	Input relay	X	128 (AHCPU501)	X0~X127
			256 (AHCPU511)	X0~X255
			512 (AHCPU521)	X0~X511
			1024 (AHCPU531)	X0~X1023
	Output relay	Y	128 (AHCPU501)	Y0~Y127
			256 (AHCPU511)	Y0~Y255
			512 (AHCPU521)	Y0~Y511
			1024 (AHCPU531)	Y0~Y1023
	Data register	D	24576 (AHCPU501)	D0~D24575
			49152 (AHCPU511)	D0~D49151
			98304 (AHCPU521)	D0~D98303
			131072 (AHCPU531)	D0~D131071
	Special data register	SR	4096	SR0~SR4095
	Link register	L	24576 (AHCPU501)	L0~L24575
			49152 (AHCPU511)	L0~L49151
			98304 (AHCPU521)	L0~L98303
			131072 (AHCPU531)	L0~L131071
	Timer	T	2048	T0~T2047
	Counter	C	2048	C0~C2047
	32-bit counter	HC	64 (128 words)	HC0~HC63
	Index register	E	32	E0~E31
Constant*	Decimal system	K	16 bits: -32768~32767 32 bits: -2147483648~2147483647	
	Hexadecimal system	16#	16 bits: 16#0~16#FFFF 32 bits: 16#0~16#FFFFFFFF	
	Single-precision floating-point number	F	32 bits: $\pm 1.17549435^{-38} \sim \pm 3.40282347^{+38}$	
	Double-precision floating-point number	DF	64 bits: $\pm 2.2250738585072014^{-308} \sim \pm 1.7976931348623157^{+308}$	

Type	Device name		Number of devices	Range
String*	String	"$"	1~31 characters	

*1: The decimal forms are notated by K in the device lists in Chapter 5 and Chapter 6 in AH500 Programming Manual, whereas K50 should be inputted in ISPSoft rather than merely 50.

*2: The floating-point numbers are notated by F/DF in the device lists in Chapter 5 and Chapter 6 in AH500 Programming Manual, whereas they are represented by decimal points in ISPSoft; for the floating-point F500, one should input 500.0.

*3: The strings are notated by "$" in Chapter 5 and Chapter 6 in AH500 Programming Manual, whereas they are represented by " " in ISPSoft; for the string of 1234, one should input "1234" in ISPSoft.

5.1.2 Basic Structure of I / O Storages

Device	Function	Access of bits	Access of words	Modification by ISPSoft	Forcing the bit ON/OFF
X	Input relay	OK	OK	OK	OK
Y	Output relay	OK	OK	OK	OK
M	Auxiliary relay	OK	-	OK	NO
SM	Special auxiliary relay	OK	-	OK	NO
S	stepping relay	OK	-	OK	NO
T	Timer	OK	OK	OK	NO
C	Counter	OK	OK	OK	NO
HC	32-bit counter	OK	OK	OK	NO
D	Data register	OK	OK	OK	NO
SR	Special data register	-	OK	OK	NO
L	Link register	OK	OK	OK	NO
E	Index register	-	OK	OK	NO

5.1.3 Relation Between the PLC Action and the Device Type

PLC action \ Device type		Non-latched area	Latched area	Output relay
Power: OFF→ON		Cleared	Retained	Cleared
STOP ↓ RUN	**The output relay is cleared.**	Retained	Retained	Cleared
	The state of the output relay is retained.	Retained	Retained	Retained
	The state of the output relay returns to that before the PLC's stopping.	Retained	Retained	Refer to the settings of device Y
	The non-latched area is cleared.	Cleared	Retained	Refer to the settings of device Y
	The state of the latched area is retained.	Retained	Retained	Retained
RUN→STOP		Retained	Retained	Retained
SM204 is ON. (All non-latched areas are cleared.)		Cleared	Retained	Cleared
SM205 is ON. (All latched areas are cleared.)		Retained	Cleared	Retained
Default value		0	0	0

5.1.4 Latched Areas in the Device Range

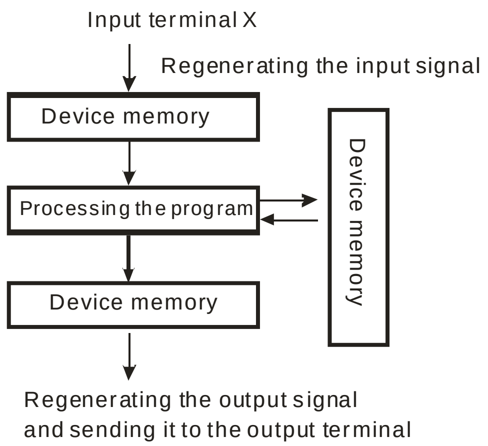
Device	Function	Latched area
X	Input relay	All devices are non-latched.
Y	Output relay	All devices are non-latched.
M*	Auxiliary relay	The default range is M0~M8191.
SM	Special auxiliary relay	Some devices are latched, and cannot be changed. Please refer to the list of special auxiliary relays for more information.
S	Stepping relay	All devices are non-latched.
T*	Timer	The default range is T0~T2047.
C*	Counter	The default range is C0~C2047.
HC*	32-bit counter	The default range is HC0~HC63.
D*	Data register	AH500-EN/RS2: The default range is D0~D16383. AH501-EN/RS2: The default range is D0~D24575.
		The default range is D0~D32767. At most 32768 devices can be latched areas.
SR	Special data register	Some are latched, and can not be changed. Please refer to the list of special data registers for more information.
L	Link register	All devices are non-latched.
E	Index register	All devices are non-latched.

*: * indicates that users can set the range of latched areas, and that the device can be set to Non-latched Area. The range of latched areas can not exceed the device range. Above all, only 32768 data registers at most can be non-latched areas. For example, users can set D50~D32817 or D32768~D65535 to Latched Areas although the default range of latched areas is D0~D32767.

5

5.2 Functions of Devices

Procedure for processing the program in the PLC:

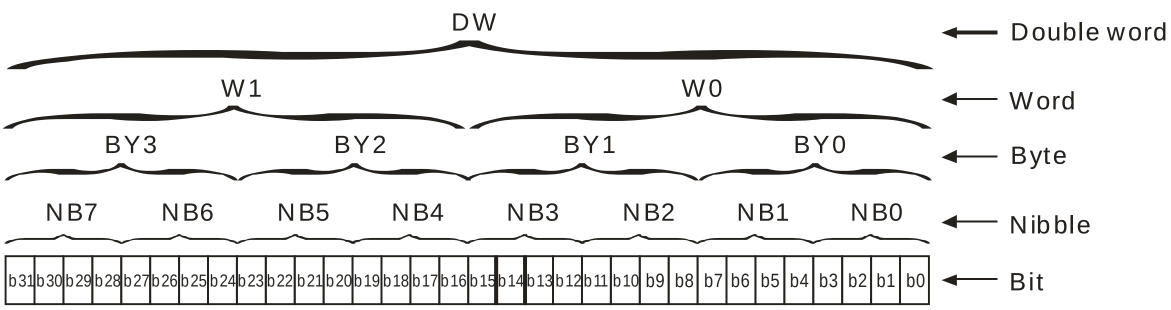


- Regenerating the input signal
  1. Before the program is executed, the state of the external input signal is read into the memory of the input signal.
  2. When program is executed, the state in the memory of the input signal does not change even if the input signal changes from ON to OFF or from OFF to ON. Not until the next scan begins will the input signal be refreshed.
- Processing the program
  After the input signal is refreshed, the instructions in the program are executed in order from the start address of the program, and the results are stored in the device memories.
- Regenerating the state of the output
  After the instruction END is executed, the state in the device memory is sent to the specified output terminal.

5.2.1 Values and Constants

Name	Description
Bit	A bit is the basic unit in the binary system. Its state is either 1 or 0.
Nibble	A nibble is composed of four consecutive bits (e.g. b3~b0). Nibbles can be used to represent 0~9 in the decimal system, or 0~F in the hexadecimal system.
Byte	A byte is composed of two consecutive nibbles (i.e. 8 bits, b7~b0). Bytes can be used to represent 00~FF in the hexadecimal system.
Word	A word is composed of two consecutive bytes (i.e. 16 bits, b15~b0). Words can be used to represent 0000~FFFF in the hexadecimal system.
Double word	A double word is composed of two consecutive words (i.e. 32 bits, b31~b0). Double words can be used to represent 00000000~FFFFFFFF in the hexadecimal system.
Quadruple word	A quadruple word is composed of four consecutive words (i.e. 64 bits, b63~b0). Quadruple words can be used to represent 0000000000000000 – FFFFFFFFFFFFFFFF in the hexadecimal system.

The relation among bits, nibbles, bytes, words, and double words in the binary system is shown below.



5.2.2 Floating-point Numbers

The floating-point numbers are represented by decimal points in ISPSoft. For example, the floating-point number of 500 is 500.0. Please refer to section 2.2.2 in AH500 Programming Manual for more information.

5.2.3 Strings

What strings can process are ASCII codes. A complete string begins with a start character, and ends with an ending character (NULL code). If what users enter is a string, they can enter 31 characters at most, and the ending character 16#00 will be added automatically in ISPSoft. Please refer to section 2.2.3 in AH500 Programming Manual for more information.

5.2.4 Input Relays

- Function of the input
  The input is connected to the input device (e.g. external devices such as button switches, rotary switches, number switches, and etc.), and the input signal is read into the PLC. Besides, contact A or contact B of the input can be used several times in the program, and the ON/OFF state of the input varies with the ON/OFF state of the input device.
- Input number (the decimal number):
  For the PLC, the input numbers start from X0.0. The number of inputs varies with the number of inputs on the digital input/output modules, and the inputs are numbered according to the order in which the digital input/output modules are connected to the CPU module. The maximum number of inputs on the PLC can reach up to 8192, and the range is between X0.0 and X511.15.

- Input type
  The inputs are classified into two types.
  1. Regenerated input: Before the program is executed, the data is fed into the PLC according to the states of the inputs which are regenerated. For example, LD X0.0.
  2. Direct input: During the execution of the instructions, the data is fed into the PLC according to the states of the inputs. For example, LD DX0.0.

5.2.5 Output Relays

- Function of the output
  The task of the output is sending the ON/OFF signal to drive the load connected to the output. The load can be an external signal lamp, a digital display, or an electromagnetic valve. There are three types of outputs. They are relays, transistors, and TRIACs (AC thyristors). Contact A or contact B of the output can be used several times in the program, but the output should be used only once in the program. Otherwise, according the program-scanning principle of the PLC, the state of the output depends on the circuit connected to the last output in the program.
- Output number (the decimal number)
  For the PLC, the input numbers start from X0.0. The number of outputs varies with the number of outputs on the digital input/output modules, and the outputs are numbered according to the order in which the digital input/output modules are connected to the PLC. The maximum number of outputs on the PLC can reach up to 8192, and the range is between Y0.0 and Y511.15.
  The output which is not practically put to use can be used as a general device.
- Output type
  The outputs are classified into two types.
  1. Regenerated output: Not until the program executes the instruction END is the information fed out according to the states of the outputs. For example, OUT Y0.0.
  2. Direct output: When the instructions are executed, the information is fed out according to the states of the outputs. For example, OUT DY0.0.

5.2.6 Auxiliary Relays

The auxiliary relay has contact A and contact B. It can be used several times in the program. Users can combine the control loops by means of the auxiliary relay, but can not drive the external load by means of the auxiliary relay. The auxiliary relays can be divided into two types according to their attributes.

1. For general use: If an electric power cut occurs when the PLC is running, the auxiliary relay for general use will be reset to OFF. When the power supply is restored, the auxiliary relay for general use is still OFF.
2. For latched use: If an electric power cut occurs when the PLC is running, the state of the auxiliary relay for latched use will be retained. When the power supply is restored, the state remains the same as that before the power electric cut.

5.2.7 Special Auxiliary Relays

Every special auxiliary relay has its specific function. Please refer to section 2.2.7 in AH500 Programming Manual for more information.

5.2.8 Stepping Relays

Function of the stepping relay:
The stepping relay can be easily used in the industrial automation to set the procedure. It is the most basic device in the sequential function chart (SFC). Please refer to ISPSoft User Manual for more information related to sequential function charts.
There are 2048 stepping relays, i.e. S0~S2047. Every stepping relay is like an output relay in that it has an output coil, contact A, and contact B. It can be used several times in the program, but it can not directly drive the external load. Besides, the stepping relay can be used as a general auxiliary relay when it is not used in the sequential function chart.

5.2.9 Timers

1. 100 millisecond timer: The timer specified by the instruction TMR takes 100 milliseconds as the timing unit.
2. 1 millisecond timer: The timer specified by the instruction TMRH takes 1 millisecond as the timing unit.
3. The timers for the subroutine's exclusive use are T1920~T2047.
4. The accumulative timers are ST0~ST2047. If users want to use the device-monitoring function, they can monitor T0~T2047.
5. If the same timer is used repeatedly in the program, including in different instructions TMR and TMRH, the setting value is the one that the value of the timer matches first.
6. If the same timer is used repeatedly in the program, it is OFF when one of the conditional contacts is OFF.
7. If the same timer is used repeatedly in the program as the timer for the subroutine's exclusive use and the accumulative timer in the program, it is OFF when one of the conditional contacts is OFF.
8. When the timer is switched from ON to OFF and the conditional contact is ON, the timer is reset and counts again.
9. When the instruction TMR is executed, the specified timer coil is ON and the timer begins to count. As the value of the timer matches the setting value, the state of the contact is as follows.

Normally open (NO) contact	ON
Normally closed (NC) contact	OFF

- **General-purpose timer**
  When the instruction TMR is executed, the general-purpose timer begins to count. As the value of the timer matches the setting value, the output coil is ON.
- **Accumulative timer**
  When the instruction TMR is executed, the accumulative timer begins to count. As the value of the timer matches the setting value, the output coil is ON. As long as users add the letter S in front of the letter T,

the timer becomes the accumulative timer. When the conditional contact is OFF, the value of the accumulative timer is not reset. When the conditional contact is ON, the timer counts from the current value.

- **Timer used in the function block**
  T1920~T2047 are the timers which users can use in the functional block or the interrupt.
  When the instruction TMR or END is executed, the timer used in the functional block begins to count. As the value of the timer matches the setting value, the output coil is ON.
  If the general-purpose timer is used in the functional block or the interrupt, and the functional is not executed, the timer can not count correctly.

5.2.10 Counters

- Characteristics of the 16-bit counter

Item	16-bit counter
Type	General type
Number	C0~C2047
Direction	Counting up
Setting value	0~32,767
Specification of the setting value	The setting value can be either the constant or the value in the data register.
Change of the current value	The counter stops counting when the value of the counter matches the setting value.
Output contact	The contact is ON when the value of the counter matches the setting value.
Reset	When the instruction RST is executed, the current value is cleared to zero, and the contact is reset of OFF.
Action of the contact	After the scan is complete, the contact acts.

- Function of the counter
  Each time the input switches from OFF to ON, the value of the counter increases by one increment. When the value of the counter matches the setting value, the output coil is ON. Users can use either the decimal constant or the value in the data register as the setting value.

16-bit counter:

1. Setting range: 0~32,767 (The setting values 0 and 1 mean the same thing in that the output contact is ON when the counter counts for the first time.)
2. For the general-purpose counter, the current value of the counter is cleared when there is a power cut. If the counter is the latched one, the current value of the counter and the state of the contact before the power cut will be retained. The latched counter counts from the current value when the power supply is restored.
3. If users use the instruction MOV or ISPSoft to transmit a value bigger than the setting value to the current value register C0, the contact of the counter C0 will be ON and the current value will become the same as the setting value next time X0.1 is switched from OFF to ON.
4. Users can use either the constant or the value in the register as the setting value of the counter.
5. The setting value of the counter can be a positive or a negative. If the counter counts up from 32,767, the next current value becomes -32,768.

5.2.11 32-bit Counters

- Characteristics of the 32-bit counter

Item	32-bit counter
Type	General type
Number	HC0~HC63
Direction	Counting up/down
setting value	-2,147,483,648~+2,147,483,647
Specification of the setting value	The setting value can be either the constant or the value occupying two data registers.
Change of the current value	The counter keeps counting after the value of the counter matches the setting value.
Output contact	The contact is ON when the value of the addition counter matches the setting value. The contact is reset to OFF when the value of the subtraction counter matches the setting value.
Reset	When the instruction RST is executed, the current value is cleared to zero, and the contact is reset of OFF.
Action of the contact	After the scan is complete, the contact acts.

- 32-bit general-purpose addition/subtraction counter
  1. Setting range: -2,147,483,648~2,147,483,647
  2. The switch between the 32-bit general-purpose addition counters and the 32-bit general-purpose subtraction counters depends on the states of the special auxiliary relays SM621~SM684. For example, the counter HC0 is the addition counter when SM621 is OFF, whereas HC0 is the subtraction counter when SM621 is ON.
  3. Users can use either the constant or the value in the data registers as the setting value of the counter, and the setting value can be a positive or a negative. If users use the value in the data registers as the setting value of the counter, the setting value occupies two consecutive registers.
  4. For the general-purpose counter, the current value of the counter is cleared when there is a power cut. If the counter is the latched one, the current value of the counter and the state of the contact before the power cut will be retained. The latched counter counts from the current value when the power supply is restored.
  5. If the counter counts up from 2,147,483,647, the next current value becomes -2,147,483,648. If the counter counts down from -2,147,483,648, the next current value becomes 2,147,483,647.

5.2.12 Data Registers

The data register stores the 16-bit data. The highest bit represents either a positive sign or a negative sign, and the values which can be stored in the data registers range from -32,768 to +32,767. Two 16-bit registers can be combined into a 32-bit register, i.e. (D+1, D) in which the register whose number is smaller represents the low 16 bits. The highest bit represents either a positive sign or a negative sign, and the values which can be stored in the data registers range from -2,147,483,648 to +2,147,483,647. Besides, four 16-bit registers can be combined into a 64-bit register, i.e. (D+3, D+2, D+1, D) in which the register whose number is smaller represents the lower 16 bits. The highest bit represents either a positive sign or a negative sign, and the values which can be stored in the data registers range from -9,223,372,036,854,776 to +9,223,372,036,854,775,807. The data registers can also be used to refresh the values in the control registers in the modules other than digital I/O modules. Please refer to ISPSoft User Manual for more information regarding refreshing the values in the control registers.

The registers can be classified into two types according to their properties.

1. General-purpose register: When the PLC begins to run, or is disconnected, the value in the register will be cleared to zero. If users want to retain the data when the PLC begins to RUN, they can refer to ISPSoft User Manual for more information. Please notice that the value will still be cleared to zero when the PLC is disconnected.
2. Latched register: If the PLC is disconnected, the data in the latched register will not be cleared. In other words, the value before the disconnection is still retained. If users want to clear the data in the latched area, they can use RST or ZRST.

5.2.13 Special Data Registers

Every special data register has its definition and specific function. Please refer to section 2.2.14 in AH500 Programming Manual for more information.

5.2.14 Link Registers

The link register is mainly used in the PLC Link or the Ether Link. When the data exchange occurs between the AH500 series programmable logic controllers, the link register can be used as the buffer. Please refer to chapter 11 for more information.
The link registers L0~L65535 add up to 65536 words. (The device range varies with the model selected.) Besides, the link register can be used as the general auxiliary register.

5.2.15 Index Registers

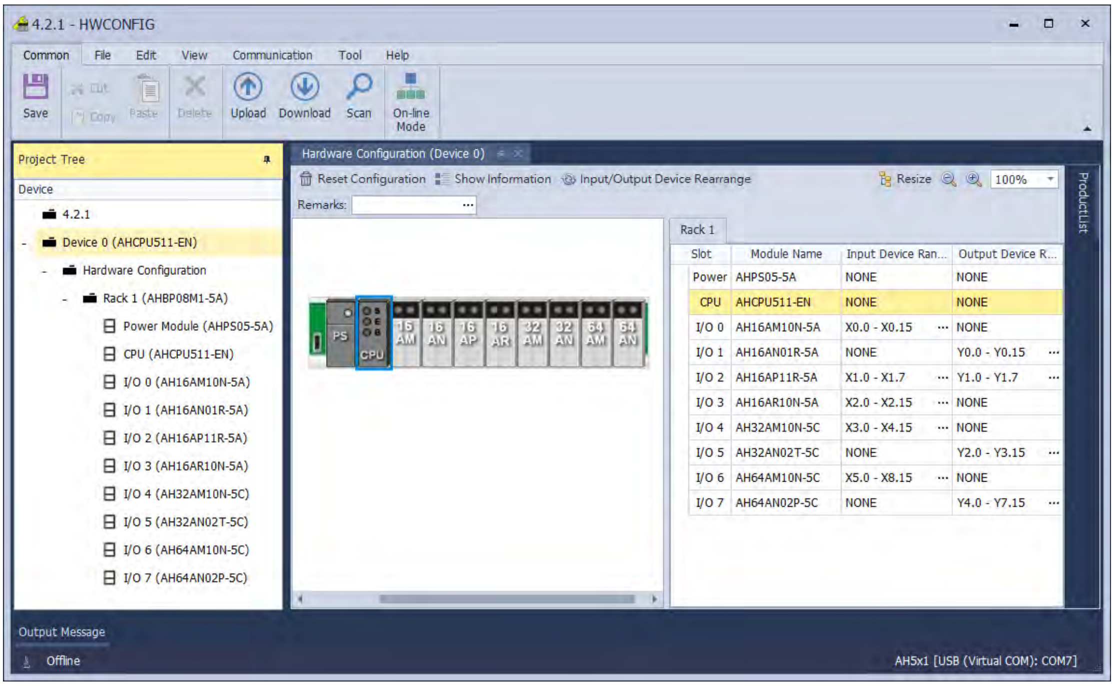
The index register is the 16-bit data register. It is like the general register in that the data can be read from it and written into it. However, it is mainly used as the index register. The range of index registers is E0~E13. Please refer to section 4.2 in AH500 Programming Manual for more information about the usage of index registers.

5.3 Assigning I/O Addresses

The assignment of input devices and that of output devices to an AH500 series input/output module installed on a local backplane are explained in this chapter.

HWCONFIG in ISPSoft

The following is the **HWCONFIG** window in ISPSoft. Please refer to chapter 8 for more information related to the hardware configuration.



Software-defined address

Addresses are automatically assigned to an input/output module through HWCONFIG in ISPSoft. In other words, a start address is automatically assigned to an input/output module through HWCONFIG in ISPSoft.

User-defined address

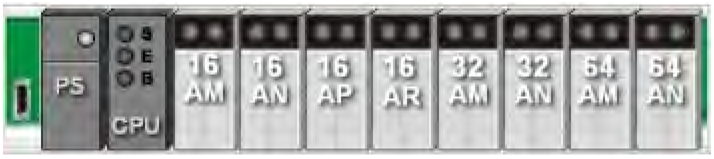
Users can assign a start address to an input/output module through HWCONFIG in ISPSoft. The advantage is that a start address assigned to an input/output module is the address set by users. Besides, users can write a program easily.

5.4 Software-defined Addresses

5.4.1 Start Addresses for Digital Input/Output Modules

Input/Output devices are automatically assigned to a digital input/output module through HWCONFIG in ISPSoft according to the number of inputs/outputs which the digital input/output module has. The default start addresses are shown below.

- AH16AM10N-5A/AH16AM30N-5A: There are 16 inputs. The input device range occupies 16 bits. (X**n**.0~X**n**.15)
- AH16AN01R-5A/AH16AN01T-5A/AH16AN01P-5A/AH16AN01S-5A: There are 16 outputs. The output device range occupies 16 bits. (Y**n**.0~Y**n**.15)
- AH16AP11R-5A/AH16AP11T-5A/AH16AP11P-5A: There are 8 inputs, and 8 outputs. The input device range occupies 16 bits, and the output device range occupies 16 bits. (X**n**.0~X**n**.7, and Y**n**.0~Y**n**.7)
- AH16AR10N-5A: There are 16 inputs. The input device range occupies 16 bits. (X**n**.0~X**n**.15)
- AH32AM10N-5A/AH32AM10N-5B/AH32AM10N-5C: There are 32 inputs. The input device range occupies 32 bits.(X**n**.0~X**n+1**.15)
- AH32AN02T-5A/AH32AN02T-5B/AH32AN02T-5C/AH32AN02P-5A/AH32AN02P-5B/AH32AN02P-5C: There are 32 outputs. The output device range occupies 32 bits. (Y**n**.0~Y**n+1**.15)
- AH64AM10N-5C: There are 64 inputs. The input device range occupies 64 bits. (X**n**.0~X**n+3**.15)
- AH64AN02T-5C/AH64AN02P-5C: There are 64 outputs. The output device range occupies 64 bits. (Y**n**.0~Y**n+3**.15)



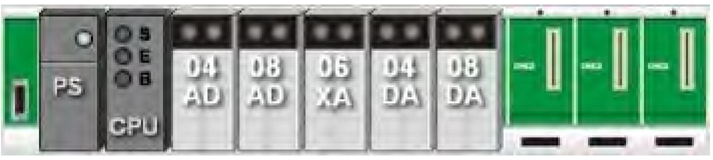
Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH16AM10N-5A	X0.0 - X0.15 ...	NONE
I/O 1	AH16AN01R-5A	NONE	Y0.0 - Y0.15 ...
I/O 2	AH16AP11R-5A	X1.0 - X1.7 ...	Y1.0 - Y1.7 ...
I/O 3	AH16AR10N-5A	X2.0 - X2.15 ...	NONE
I/O 4	AH32AM10N-5C	X3.0 - X4.15 ...	NONE
I/O 5	AH32AN02T-5C	NONE	Y2.0 - Y3.15 ...
I/O 6	AH64AM10N-5C	X5.0 - X8.15 ...	NONE
I/O 7	AH64AN02P-5C	NONE	Y4.0 - Y7.15 ...

5.4.2 Start Addresses for Analog Input/Output Modules

Input/Output data registers are automatically assigned to an analog input/output module through HWCONFIG in ISPSoft according to the number of registers which is defined for the analog input/output module. A channel occupies two words.

- AH04AD-5A: There are 4 input channels. The input device range occupies 8 data registers.
- AH08AD-5B/AH08AD-5C: There are 8 input channels. The input device range occupies 16 data registers
- AH06XA-5A: There are 4 input channels, and 2 output channels. The input device range occupies 8 data registers, and the output device range occupies 4 data registers.
- AH04DA-5A: There are 4 output channels. The output device range occupies 8 data registers.
- AH08DA-5B/AH08DA-5C: There are 8 output channels. The output device range occupies 16 data registers.



Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH04AD-5A	D0 - D7 ···	NONE
I/O 1	AH08AD-5A	D8 - D23 ···	NONE
I/O 2	AH06XA-5A	D24 - D31 ···	D32 - D35 ···
I/O 3	AH04DA-5A	NONE	D36 - D43 ···
I/O 4	AH08DA-5A	NONE	D44 - D59 ···
I/O 5		NONE	NONE
I/O 6		NONE	NONE
I/O 7		NONE	NONE

5.4.3 Start Addresses for Temperature Measurement Modules

Input data registers are automatically assigned to a temperature measurement module through HWCONFIG in ISPSoft according to the number of registers which is defined for the temperature measurement module. A channel occupies two words.

- AH04PT-5A: There are 4 input channels. The input device range occupies 8 data registers.
- AH08PTG-5A: There are 8 input channels. The input device range occupies 16 data registers.
- AH04TC-5A: There are 4 input channels. The input device range occupies 8 data registers.
- AH08TC-5A: There are 8 input channels. The input device range occupies 16 data registers

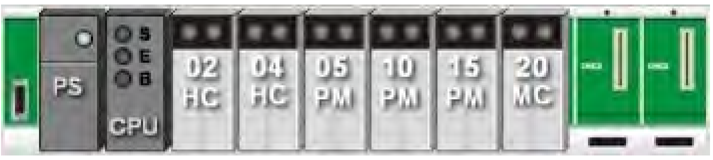
Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH04PT-5A	D0 - D7 ...	NONE
I/O 1	AH08PTG-5A	D8 - D23 ...	NONE
I/O 2	AH04TC-5A	D24 - D31 ...	NONE
I/O 3	AH08TC-5A	D32 - D47 ...	NONE
I/O 4		NONE	NONE
I/O 5		NONE	NONE
I/O 6		NONE	NONE
I/O 7		NONE	NONE

5.4.4 Start Addresses for Motion Control Modules

Input/Output data registers are automatically assigned to a motion control module through HWCONFIG in ISPSoft according to the number of registers which is defined for the motion control module.

- AH02HC-5A: There are 2 input channels. The input device range occupies 14 data registers, and the output device range occupies 2 data registers.
- AH04HC-5A: There are 4 input channels. The input device range occupies 28 data registers, and the output device range occupies 4 data registers.
- AH05PM-5A: No input registers and no output registers are assigned to it. Please refer to AH5000 Motion Control Module Manual for more information about the parameter setting.
- AH10PM-5A: No input registers and no output registers are assigned to it. Please refer to AH5000 Motion Control Module Manual for more information about the parameter setting.
- AH15PM-5A: No input registers and no output registers are assigned to it. Please refer to AH5000 Motion Control Module Manual for more information about the parameter setting.
- AH20MC-5A: No input registers and no output registers are assigned to it. Please refer to AH5000 Motion Control Module Manual for more information about the parameter setting.



Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH02HC-5A	D0 - D13 …	D14 - D15 …
I/O 1	AH04HC-5A	D16 - D43 …	D44 - D47 …
I/O 2	AH05PM-5A	NONE	NONE
I/O 3	AH10PM-5A	NONE	NONE
I/O 4	AH15PM-5A	NONE	NONE
I/O 5	AH20MC-5A	NONE	NONE
I/O 6		NONE	NONE
I/O 7		NONE	NONE

5.4.5 Start Addresses for Network Modules

Input/Output data registers are automatically assigned to a network module through HWCONFIG in ISPSoft according to the number of registers which is defined for the network module.

- AH10/15EN-5A: The input device range occupies 20 data registers, and the output device range occupies 20 data registers.
- AH10/15SCM-5A: The input device range occupies 18 data registers.
- AH10DNET-5A: No input registers and no output registers are assigned to it.
- AH10PFBS-5A: No input registers and no output registers are assigned to it.
- AH10PFBM-5A: The input device range occupies 15 data registers.
- AH10COPM-5A: The input device range occupies 2 data registers.
- 15SCM: The input device range occupies 18 data registers.

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH10EN-5A	D0 - D19 ...	D20 - D39 ...
I/O 1	AH10SCM-5A	D40 - D57 ...	NONE
I/O 2	AH10DNET-5A	NONE	NONE
I/O 3	AH10PFBS-5A	NONE	NONE
I/O 4	AH10PFBM-5A	D58 - D72 ...	NONE
I/O 5	AH10COPM-5A	D73 - D74 ...	NONE
I/O 6	AH15SCM-5A	D75 - D92 ...	NONE
I/O 7		NONE	NONE

5.5 User-defined Addresses

5.5.1 Start Addresses for Digital Input/Output Modules

Users can assign input devices and output devices to a digital input/output module through HWCONFIG in ISPSoft. The input devices should be in the range of X**n**.0 and the output devices should be in the range of to Y**n**.0; **n** indicates any integer between 0 and 511. Take AH16AP11R-5A for instance. The original input devices are X0.0~X0.7, and the original output devices are Y0.0~Y0.7. Users can change the input device range from X10.0 to X10.7, and change the output device range from Y20.0~Y20.7.

- Default input/output device range: X0.0~X0.7 and Y0.0~Y0.7

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH16AP11T-5A	X0.0 - X0.7 …	Y0.0 - Y0.7 …

- User-defined input/output device range: X10.0~X10.7, and Y20.0~Y20.7

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH16AP11T-5A	X10.0 - X10.7 …	Y20.0 - Y20.7 …

5.5.2 Start Addresses for Analog Input/Output Modules

Users can assign input registers and output registers to an analog input/output module through HWCONFIG in ISPSoft. The input registers and the output registers should be in the range of D0 to D65535. Take AH06XA-5A for instance. The original input registers are D0~D7, and the original output registers are D8~D11. Users can change the input device range from D0~D7 to D50~D57, and change the output device range from D8~D11 to D100~D103.

- Default input/output device range: D0~D7, and D8~D11

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH06XA-5A	D0 - D7 …	D8 - D11 …

- User-defined input/output device range: D50~D57, and D100~D103

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH06XA-5A	D50 - D57 …	D100 - D103 …

5.4.3 Start Addresses for Temperature Measurement Modules

Users can assign input registers to a temperature measurement module through HWCONFIG in ISPSoft. The input registers should be in the range of D0 to D65535. Take AH08TC-5A for instance. The original input registers are D0~D15. Users can change the input device range from D0~D15 to D60~D75.

- Default input device range: D0~D15

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH08TC-5A	D0 - D15	NONE

- User-defined input device range: D60~D75

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH08TC-5A	D60 - D75	NONE

5.4.4 Start Addresses for Motion Control Modules

Users can assign input registers and output registers to a motion control module through HWCONFIG in ISPSoft. The input registers should be in the range of D0 to D65535, and the output registers should be in the range of D0 to D65535. Take AH04HC-5A for instance. The original input registers are D0~D27. Users can change the input device range from D0~D27 to D200~D227.

- Default input device range: D0~D27

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH04HC-5A	D0 - D27	D28 - D31

- User-defined input device range: D200~D227

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH04HC-5A	D200 - D227	D28 - D31

5.4.5 Start Addresses for Network Modules

Users can assign input registers and output registers to a network module through HWCONFIG in ISPSoft. The input registers should be in the range of D0 to D65535, and the output registers should be in the range of D0 to D65535. Take AH10EN-5A for instance. The original input registers are D0~D19. Users can change the input device range from D0~D19 to D150~D169.

- Default input device range: D0~D19

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH10EN-5A	D0 - D19 ...	D20 - D39 ...

- User-defined input device range: D150~D169

Rack 1

Slot	Module Name	Input Device Range	Output Device Range
Power	AHPS05-5A	NONE	NONE
CPU	AHCPU511-EN	NONE	NONE
I/O 0	AH10EN-5A	D150 - D169 ...	D20 - D39 ...

Chapter 6 Writing a Program

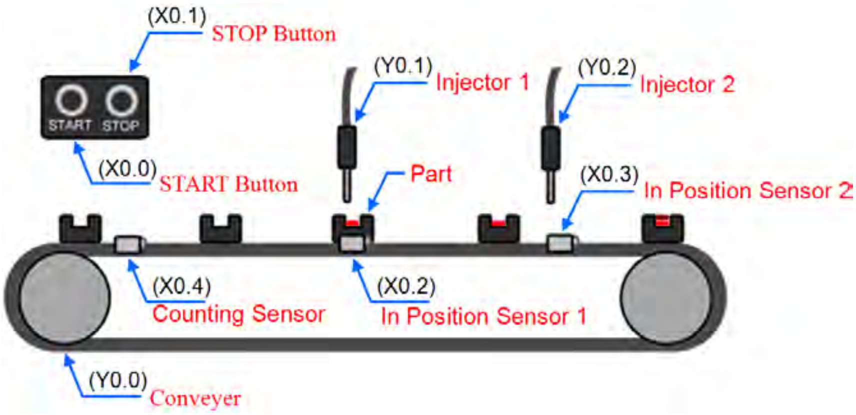
Table of Contents

6.1 Quick Start

The chapter provides a simple example, and leads users to create a traditional ladder diagram in ISPSoft in a short time. However, in order to help users who are not familiar with IEC 61131-3 understand the functions provided by ISPSoft, and create a traditional ladder diagram, programming concepts related to IEC 61131-3 are not introduced in this chapter. For example, POUs, function blocks, variables, and etc. are not introduced.

6.1.1 Example

When the equipment operates, the parts on the conveyer are conveyed from left to right. If a sensor senses that a part is under an injector, the PLC will send a trigger signal to the injector, and the injector will injects the glue. How long the part will be injected is set externally, and is not controlled by the program in the PLC. However, the program in the PLC must be able to turn the trigger signal OFF so that the trigger signal can be sent next time. There are two injectors above the conveyer, and the two injectors inject glue in the same way. Besides, there is a sensor at the left side of the conveyer. When a part passes the sensor, the sensor value increases by one increment. If the sensor value is 100, the internal completion flag will be set to ON. The state of the flag can be used by other procedures later. However, the use of the state of the flag is not introduced in this example.



6

6.1.2 Hardware

In this example, the AH500 series CPU module used is **AHCPU530-EN**, the digital I/O module used is **AH16AP11R-5A**, and the main backplane used is **AHBP04M1-5A**. The table below is an I/O allocation table.

Type	ID	Description
Digital input	X0.0	START button
Digital input	X0.1	STOP button
Digital input	X0.2	In position sensor 1
Digital input	X0.3	In position sensor 2
Digital input	X0.4	Counting sensor
Digital output	Y0.0	Conveyer
Digital output	Y0.1	Trigger signal for injector 1
Digital output	Y0.2	Trigger signal for injector 2

6.1.3 Program

(1) When the START button (X0.0) is turned from OFF to ON, the internal operation flag is set to ON, and the conveyer (Y0.0) starts to run. When the STOP button (X0.1) is turned from OFF to ON, an error occurs (the error flag is ON), the operation flag is reset to OFF, and the conveyer stops running.

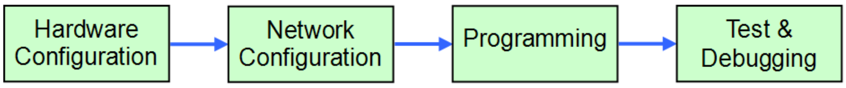
(2) When in position sensor 1 (X0.2) is ON, the trigger signal for injector 1 (Y0.1) is set to ON. When in position sensor 1 is OFF, the trigger signal for injector 1 is reset to OFF.

(3) When in position sensor 2 (X0.3) is ON, the trigger signal for injector 2 (Y0.2) is set to ON. When in position sensor 2 is OFF, the trigger signal for injector 2 is reset to OFF.

(4) When the counting sensor (X0.4) is turned from OFF to ON, the sensor value increases by one increment. If the sensor value is larger than or equal to 100, the internal completion flag will be set to ON.

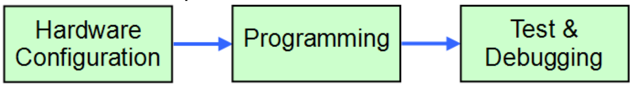
6.2 Procedure for Creating a Project in ISPSoft

The procedure for creating a project in ISPSoft is as follow. Users can adjust the procedure according to the practical application and their habits.



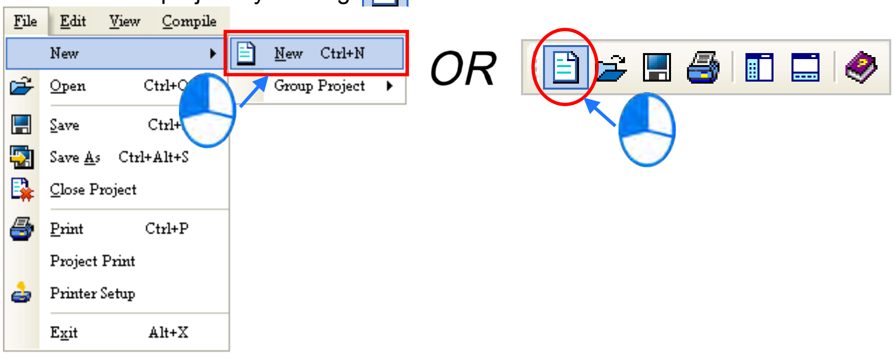
- **Hardware configuration**
  Users can set the parameters such as a range of latched devices and a port number in a PLC. Besides, the users have to configure modules used with an AH500 series CPU module, and set the parameters in these modules.
- **Network configuration**
  If a system used adopts network architecture, or devices need to exchange data, users can configure a network, a PLC Link, or an Ether Link easily through the network configuration tool **NWCONFIG** in ISPSoft.
- **Programming**
  After users write a program in ISPSoft, they can compile the program. If the compiling of a program is unsuccessful, the messages in the **Compile Message** page can lead users to the places where errors occur to check the program code.
- **Test and debugging**
  Users can download a program which is compiled, a hardware configuration, and a network configuration to a PLC. Besides, the users can test and debug the program online by means of the functions provided by ISPSoft.

Owing to the fact that the example introduced in this chapter does not discuss a network configuration, only the following procedure is carried out. The procedure will be introduced in the following section.

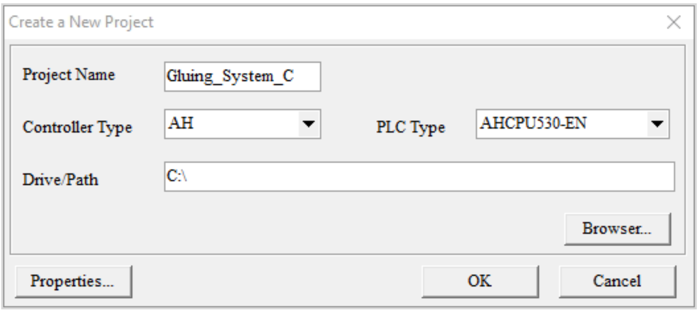


6.3 Creating a Project

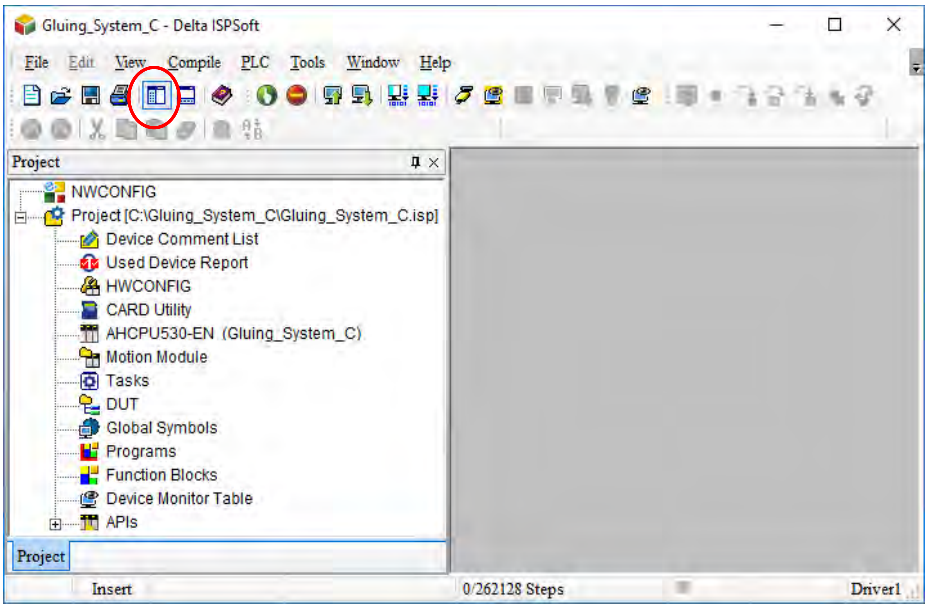
After ISPSoft is started, users can click the **File** menu, point to **New**, and click **New** to create a new project. They can also create a new project by clicking  on the toolbar after ISPSoft is started.



In the **Create a New Project** window, type a project name in the **Project Name** box and a path in the **Drive/Path** box, select a PLC in the **Controller Type** drop-down list box, and click **OK**. (The PLC used in this example is AHCPU530-EN.)



After the project is created successfully, a project management area will appear at the left side of the main screen. The relation between the items listed in the project management area is represented by a hierarchical tree structure. If the project management area does not appear, the users can click **Workspace** on the **View** menu, or click  on the toolbar.

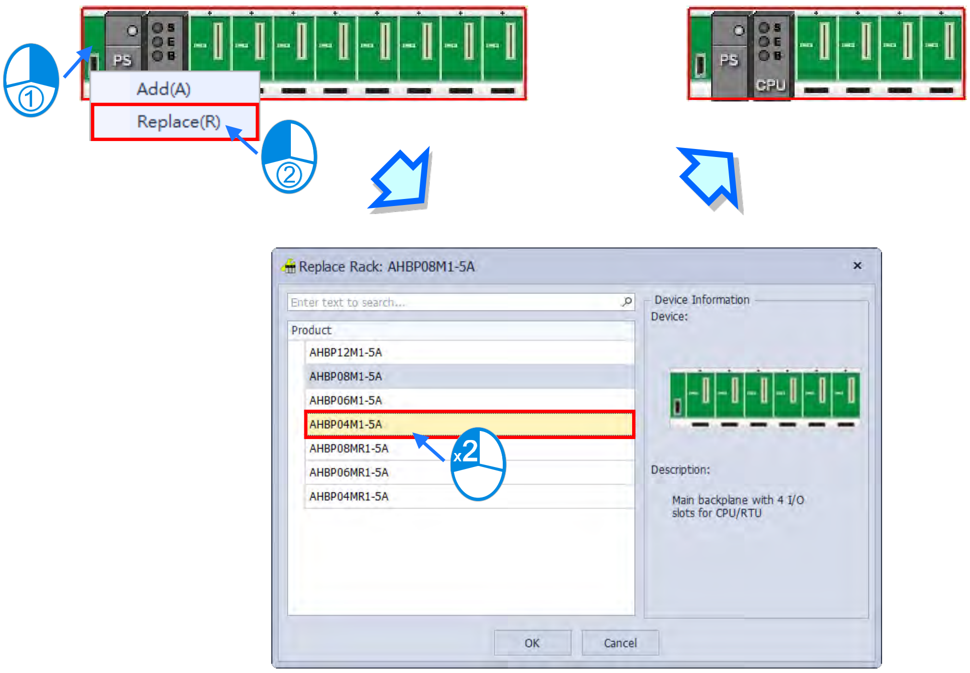


6.4 Hardware Configuration

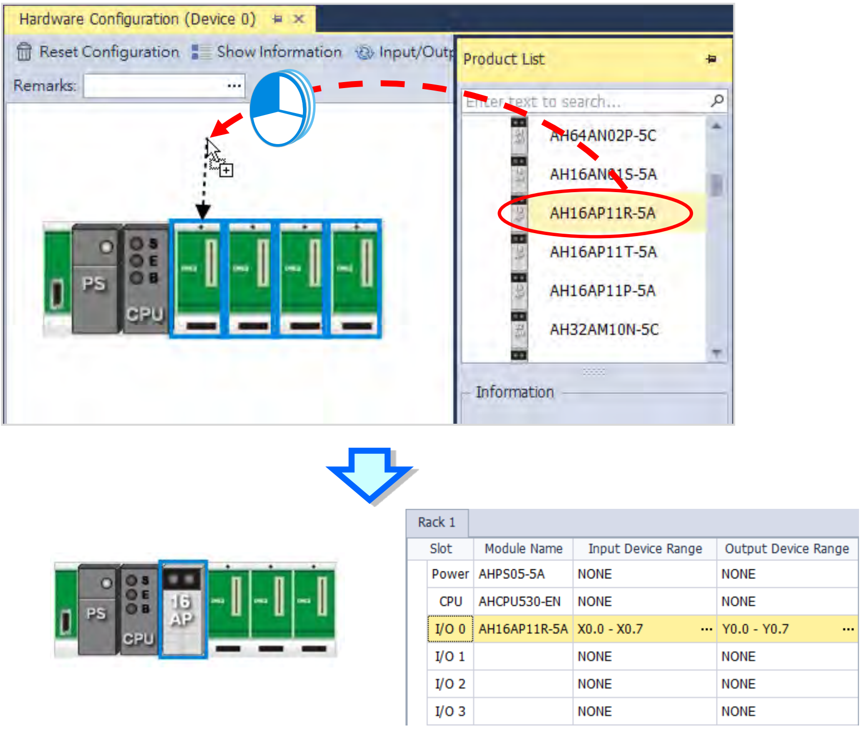
After users double-click **HWCONFIG** in the project management area, the **HWCONFIG** window will appear.

6.4.1 Configuring a Module

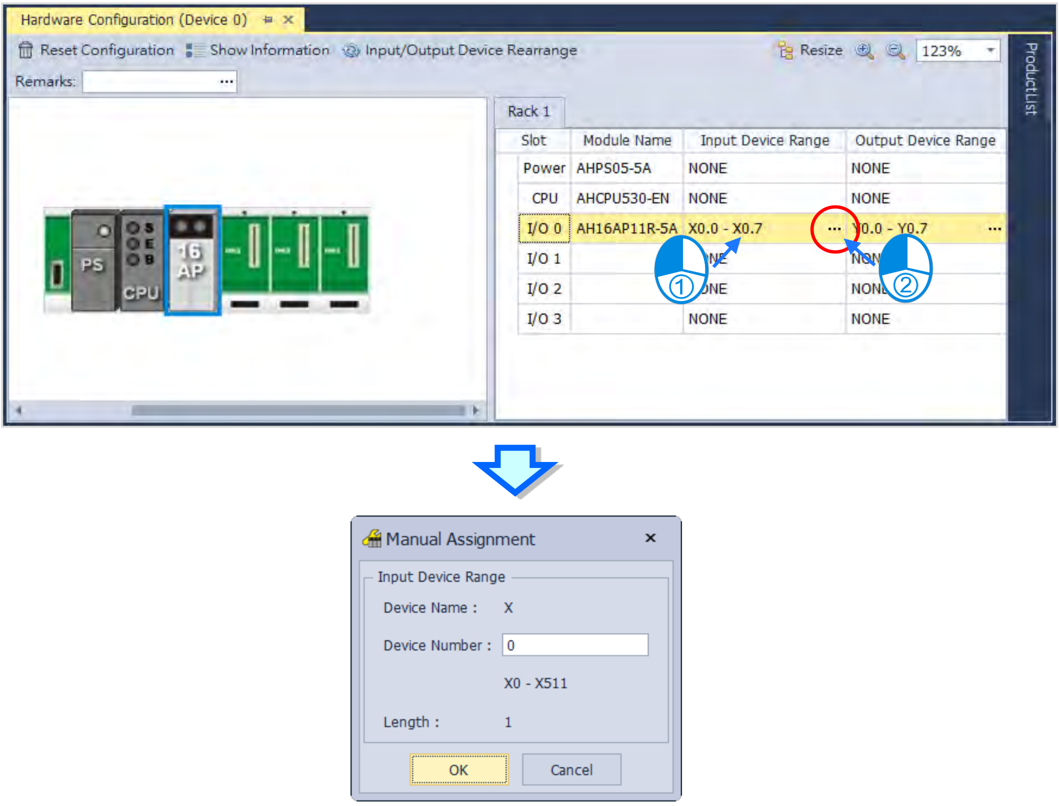
In the **HWCONFIG** window, there is an eight-slot backplane on which a CPU module and a power supply module are installed. However, the backplane used in this example is the four-slot backplane **AHBP04M1-5A** on which the digital I/O module **AH16AP11R-5A** is installed.
If users want to replace the backplane, they can right-click the left side of the rack in the system configuration area, click **Replace** on the context menu, and double-click **AHBP04M1-5A** in the **Rack Selection** window.



Unfold the **Digital I/O Module** section on the product list, find **AH16AP11R-5A**, and drag the module to a vacant slot on the backplane in the system configuration area. After the module is added successfully, the related information and the devices assigned to the module will be listed in the table at the bottom of the window.



The system automatically assigns devices to a module which is added. If the devices assigned to a module do no conform to what is expected, users can click the **Input/Output Device Range** cell for the module, click ··· in the cell, and type a device address in the **Manual Assignment** window.

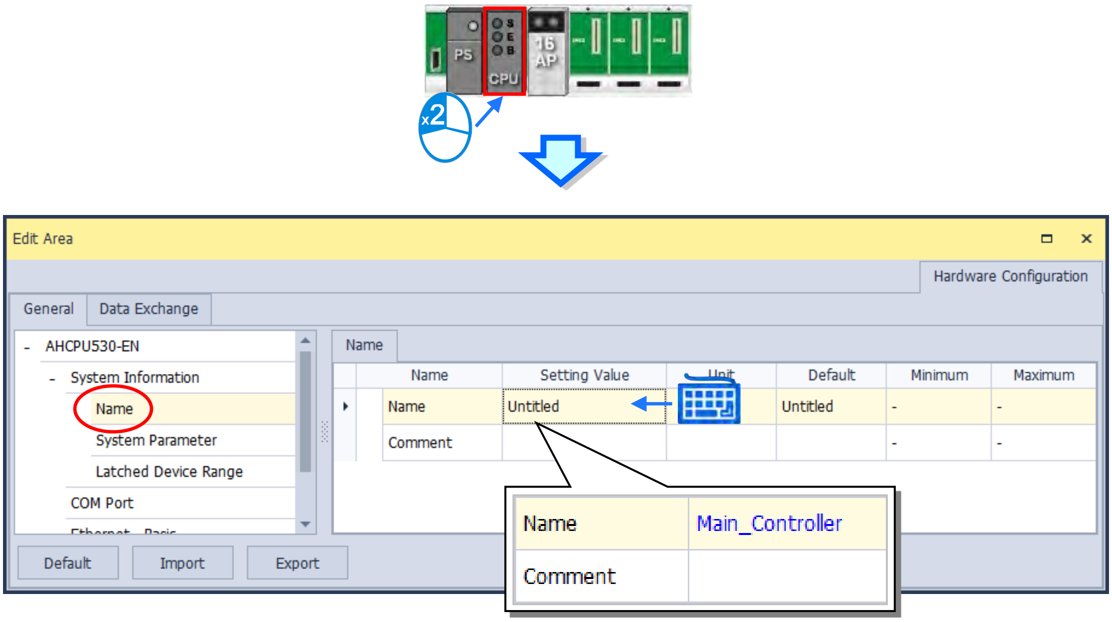


6.4.2 Setting the Parameters in a CPU Module and a Module

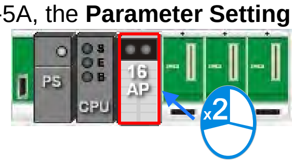
After **AH16AP11R-5A** is configured, users can set the parameters in the CPU module and the parameters in the extension module. After the users double-click the CPU module or the extension module, a corresponding window will appear.

After the CPU module is double-clicked, the **PLC Parameter Setting** window will appear. The users can click the primary tabs at the top of the window, and the secondary tables at the bottom of the window to set the parameters. In this example, the users only need to define the name of the CPU module.

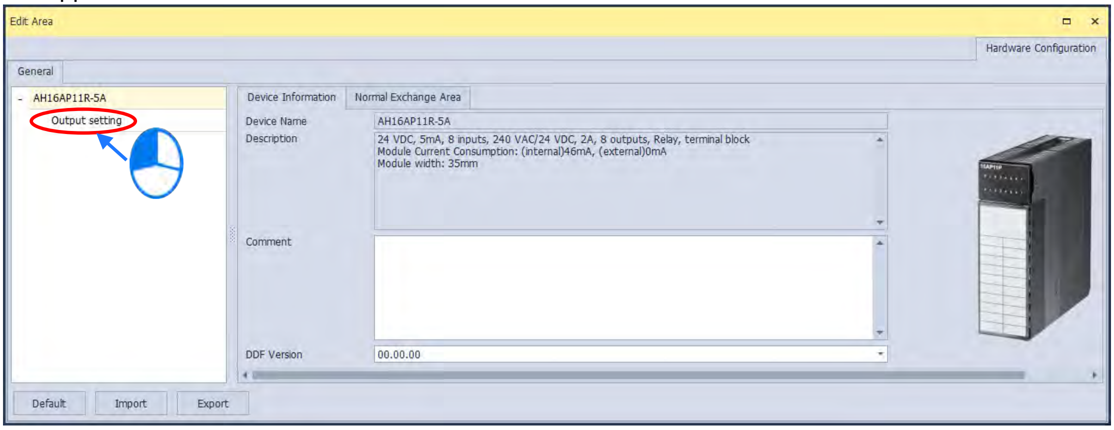
After the users click the **CPU** tab at the top of the window, and the **Name** tab at the bottom of the window, they can type a name in the **Name** box. The users will find the default name in the **Name** box is the same as the project name. Delete the default name, type “Main_Controller” in the **Name** box, and click **OK**.

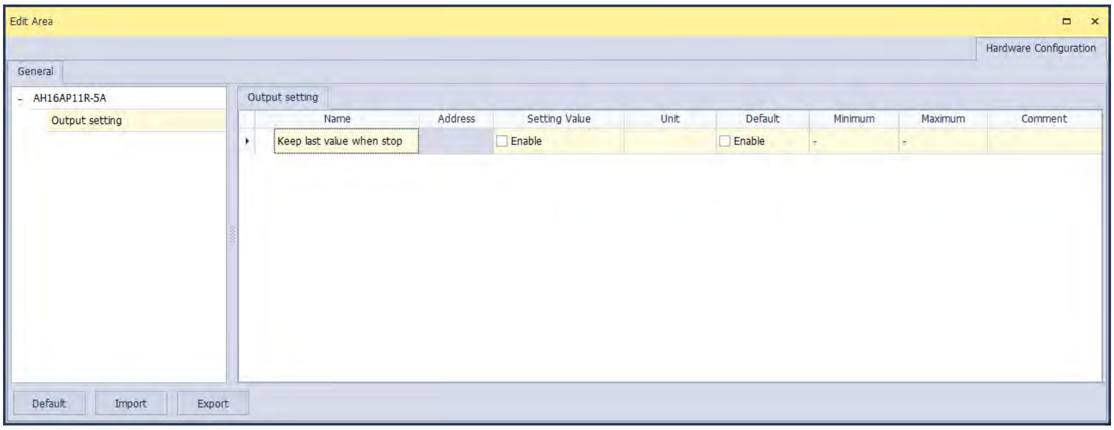


After the users double-click AH16AP11R-5A, the **Parameter Setting** window will appear.

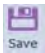


After the **Parameter Setting** window is opened, the users can view the information related to the module. The users can select the parameter type at the left side of the window, and then set the parameter in the table at the right side of the window.
In this example, the default values are retained. Therefore, the step of setting the parameter in AH16AP11R-5A is skipped.

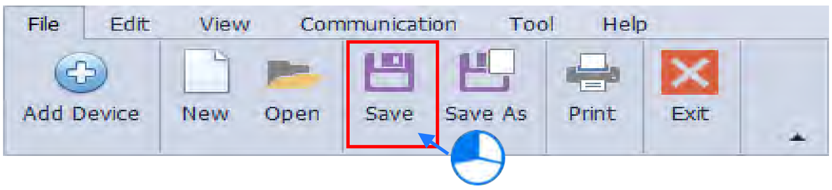




The hardware configuration is not complete until the parameters in the CPU module and AH16AP11R-5A are set. However, the configuration and the setting must be downloaded to the CPU module so that they can take effect. The configuration and the setting are saved here, and will be downloaded with the program in the project later.

If the users want to save the configuration and the setting, they can click **Save** on the **File** menu, or  on

the toolbar. After the configuration and the setting are saved, the users can close the **HWCONFIG** window.



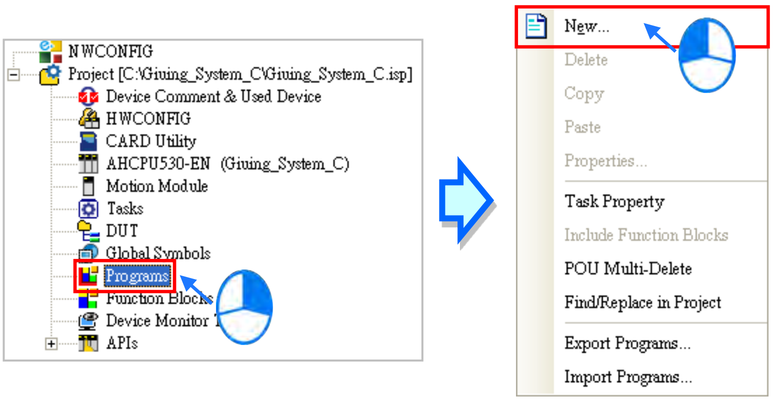
***. Please refer to chapter 8 for more information about HWCONFIG.**

6.5 Creating a Program

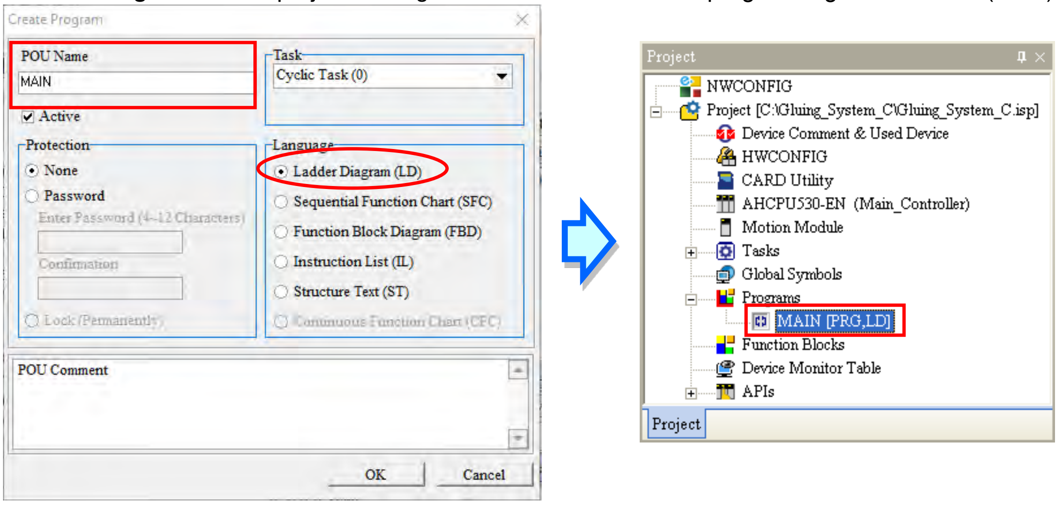
The following sections will lead users to create a traditional ladder diagram in ISPSoft. The contents of the following sections include creating a POU, editing a traditional diagram, and compiling a program. The users are expected to equip themselves with the basic abilities to create a traditional ladder diagram in a short time.

6.5.1 Adding a Ladder Diagram

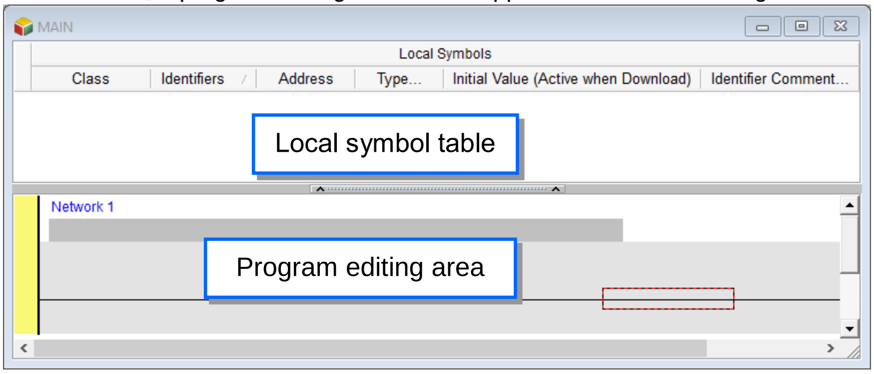
(1) Right-click **Programs** in the project management area, point to **POU** on the context menu, and click **New…**.



(2) Type a program name in the **POU Name** box, select the **Ladder Diagram (LD)** option button in the **Language** section, and retain the other default values. Click **OK** after the setting is complete. An item will be under **Programs** in the project management area. The item is a program organization unit (POU).



(3) After the POU is added, a program editing window will appear in the main working area.



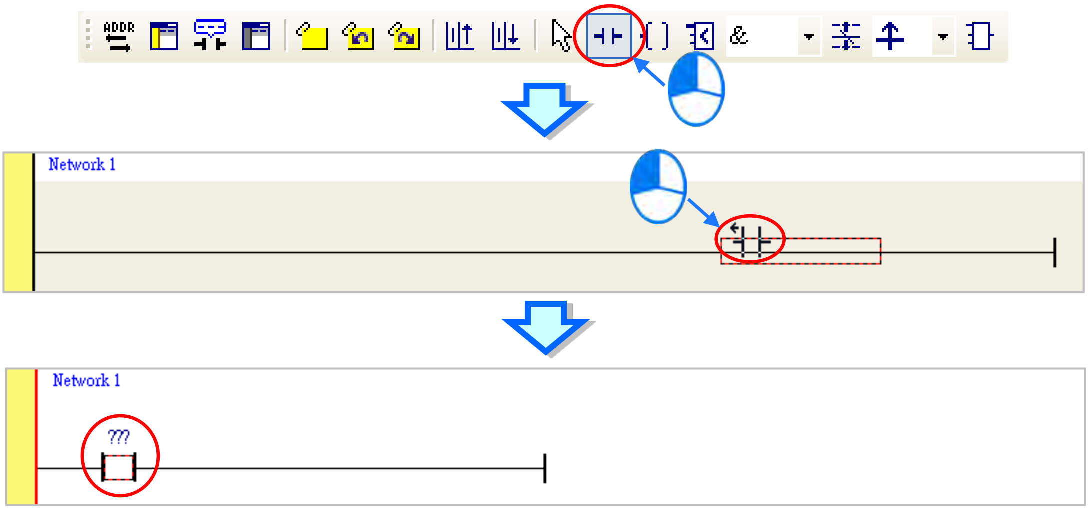
After the program editing window is opened, the corresponding toolbar will appear in the window. The functions are described below.

Icon	Keyboard shortcut	Function
	None	Switching to address mode
	Shift+Ctrl+C	Displaying/Hiding the comments on the networks
	None	Displaying/Hiding the commands on the devices
	Shift+Ctrl+A	Activating/Inactivating the network selected
	Shift+Ctrl+B	Adding a bookmark to the network selected or deleting a bookmark from the network selected
	Shift+Ctrl+P	Going to the previous bookmarked position
	Shift+Ctrl+N	Going to the next bookmarked position
	Ctrl+I	Putting a network above the network selected
	Shift+Ctrl+I	Putting a network under the network selected
	ESC	Selection
	Typing an instruction	Inserting a contact
	Typing an instruction	Inserting a coil
	Typing an instruction	Inserting a comparison contact
&	Typing an instruction	Selecting a type of comparison contact
	Typing an instruction	Inserting a block logic instruction (NP/PN/INV/FB_NP/FB_PN)
	Typing an instruction	Selecting a type of block logic instruction (NP/PN/INV/FB_NP/FB_PN)
	Shift+Ctrl+U	Inserting an instruction or a function block

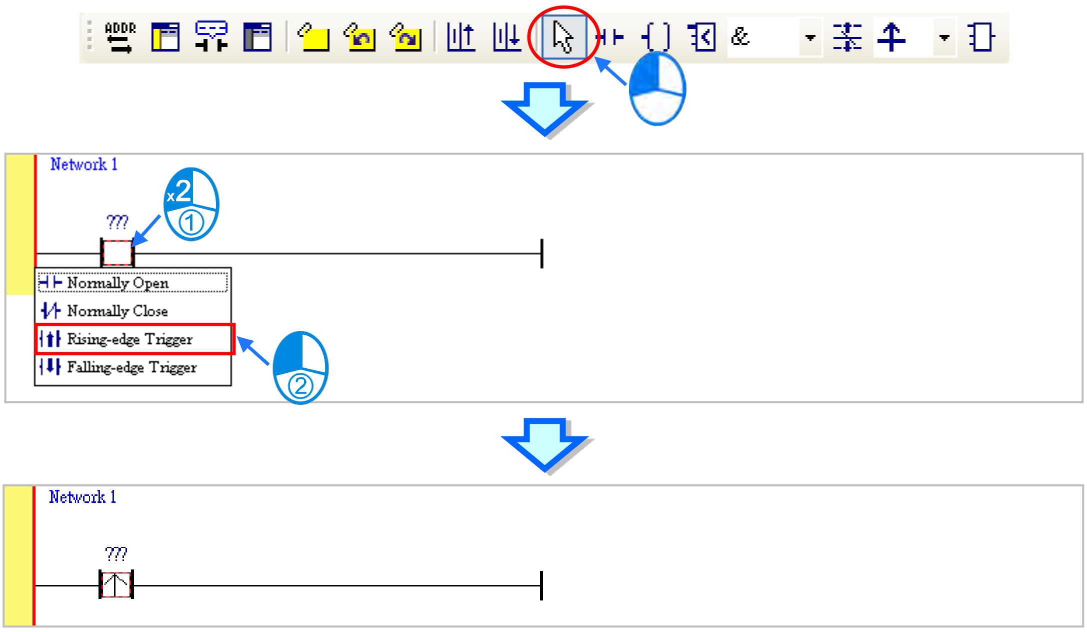
***. Please refer to section 6.5.3 for more information about typing an instruction.**

6.5.2 Basic Editing - Creating a Contact and a Coil

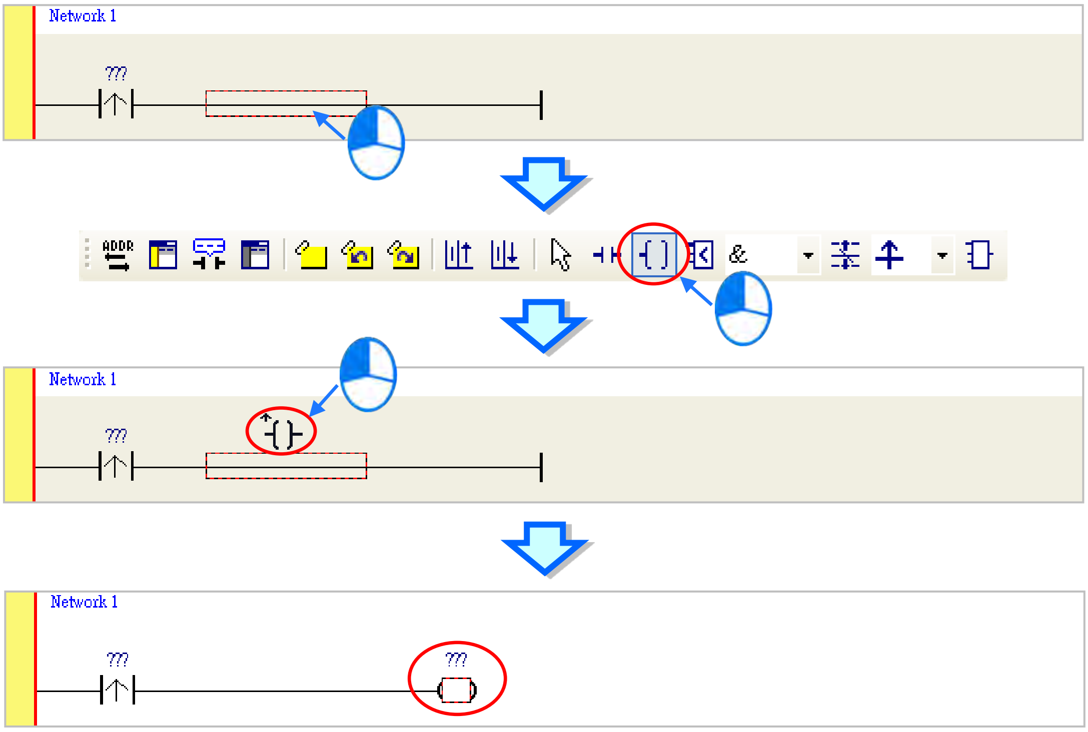
(1) Click on the toolbar, and then move the mouse cursor to the red frame in network 1. The mouse cursor appears as a contact when the mouse cursor is moved to the left side of the red frame, the right side of the red frame, or the bottom of the red frame. Users can decide where to insert a contact. If a ladder diagram is edited, the mouse cursor must be near a position which is edited. Besides, an object inserted is arranged by the system automatically. Users can not move the object at will.
In this example, users do not need to decide where to insert the contact. Therefore, the mouse cursor can be near the red frame, and the users can click the left mouse button.



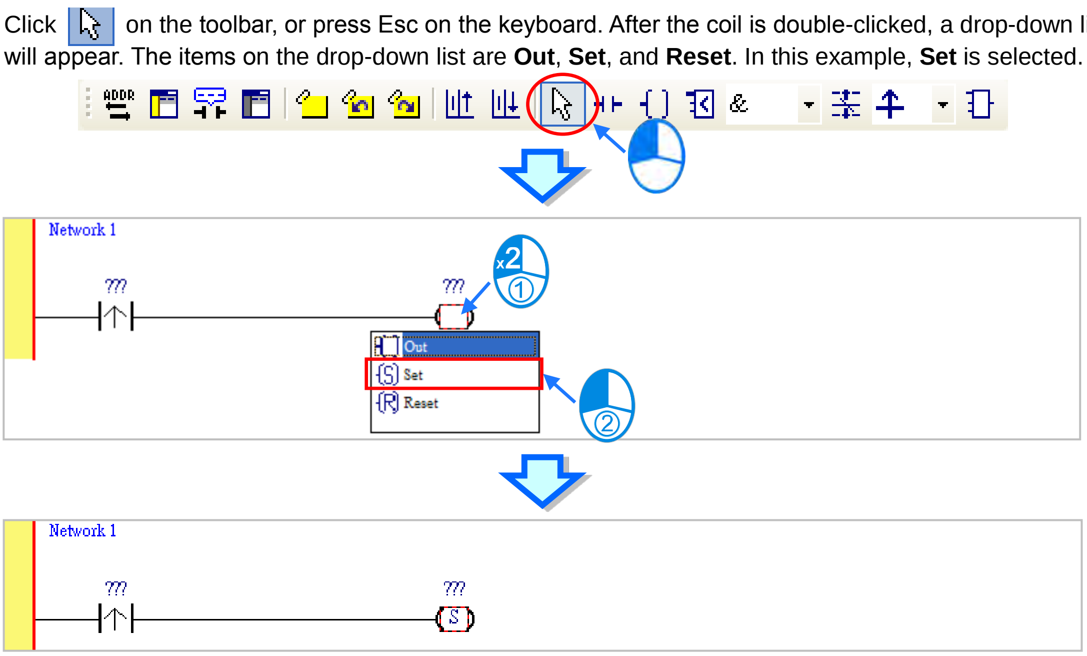
(2) Click on the toolbar, or press Esc on the keyboard. After the contact is double-clicked, a drop-down list will appear. The items on the drop-down list are **Normally Open**, **Normally Close**, **Rising-edge Trigger**, and **Falling-edge Trigger**. In this example, **Rising-edge Trigger** is selected.



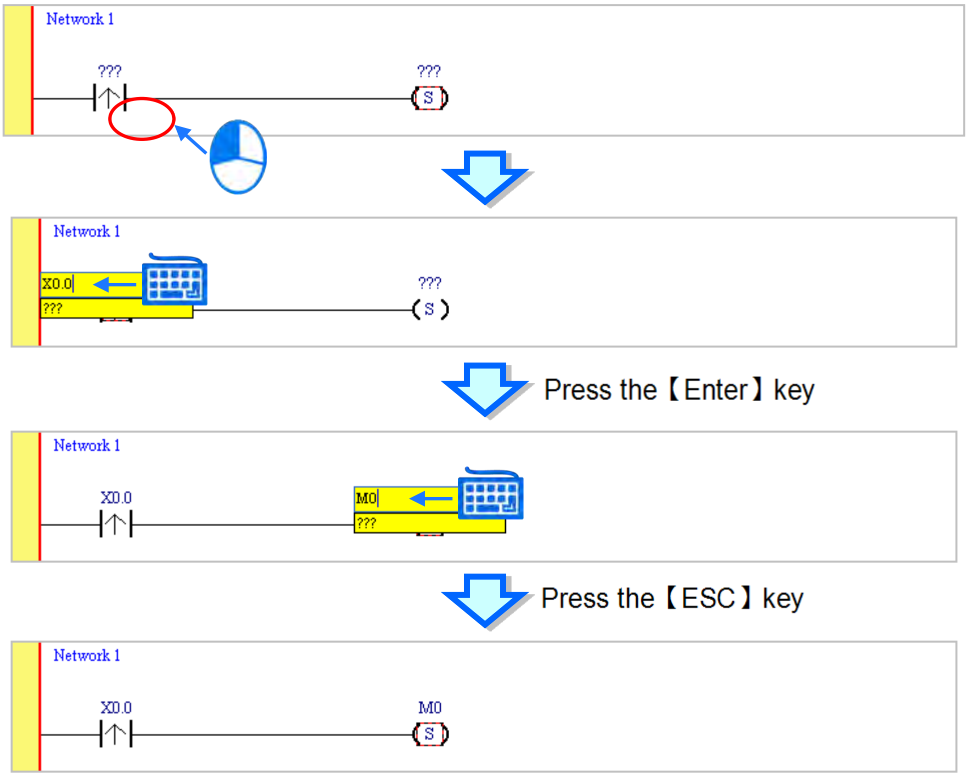
(3) Click the line at the right side of the contact, click on the toolbar, and move the mouse cursor to the red frame. Likewise, the mouse cursor appears as a coil when the mouse cursor is above or under the red frame. Users can decide where to insert the coil.
In this example, the users do not need to decide where to insert the coil. Therefore, the mouse cursor can be near the red frame, and the users can click the left mouse button.



(4) Click on the toolbar, or press Esc on the keyboard. After the coil is double-clicked, a drop-down list will appear. The items on the drop-down list are **Out**, **Set**, and **Reset**. In this example, **Set** is selected.



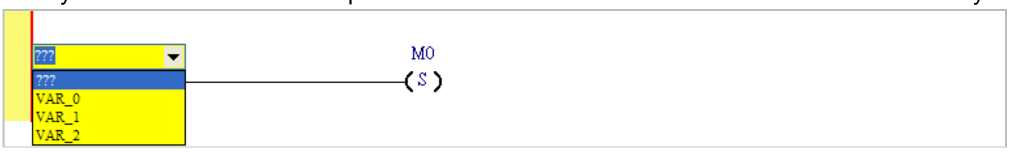
(5) Click ??? above the contact, type a device address in the box, and press Enter on the keyboard to jump to the next box in the network. After a device address is typed in the box, the users can press Esc on the keyboard to complete the editing. In this example, X0.0 is typed in the box for the contact, and M0 is typed in the box for the coil.



Additional remark

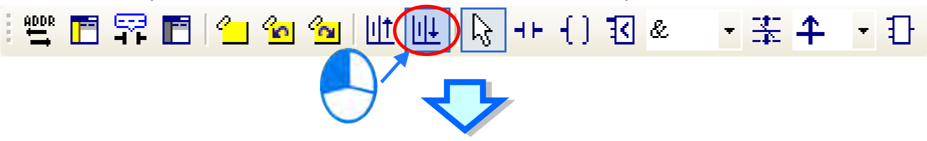
After users click a network and press Enter on the keyboard, they can edit a box. The users can edit the next box in the network after they press Enter on the keyboard. Besides, the next network is selected after the users press Tab on the keyboard. The users can edit a box with the keyboard. After the editing is complete, the users can press Enter on the keyboard to jump to the next box. If the users want to end the editing, they can press Esc on the keyboard.

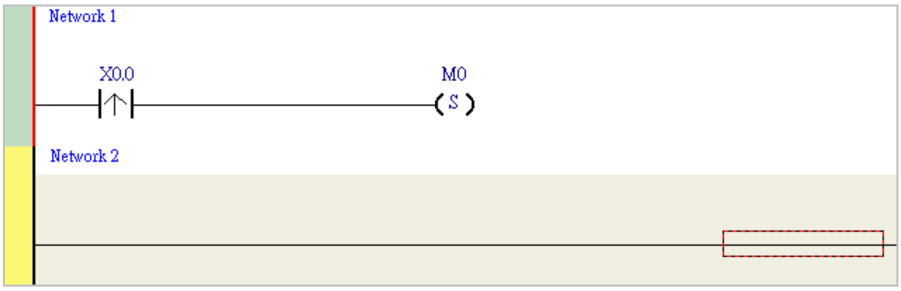
If the users have declared symbols, and the address field is still in editing status, users can clear the device editing field and the system automatically shows a dropdown list that is suitable for the symbol. Click ▼ in a box, or press Page Down on the keyboard when they edit the box. The symbols on the drop-down list are the symbols which can be assigned to the object. The users can select a symbol by the mouse or the up/down key on the keyboard. Please refer to chapter 6 in ISPSoft User Manual for more information about symbols.



6.5.3 Basic Editing - Inserting a Network and Typing an Instruction

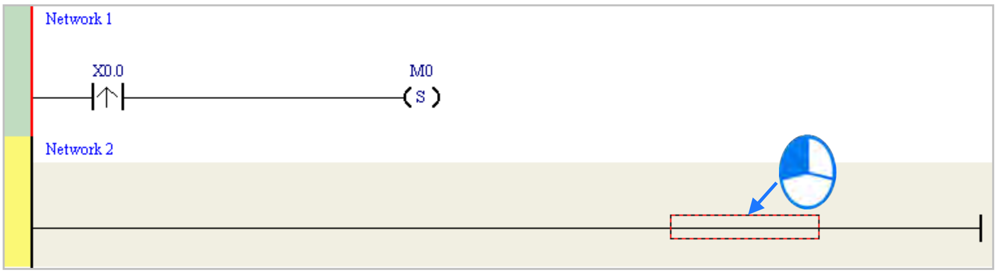
After on the toolbar is clicked, a network will be under the network selected. After on the toolbar is clicked, a network will be put above the network selected. In this example, a network is under network 1.



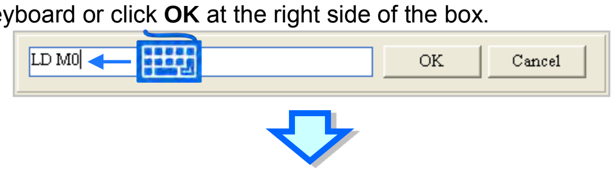


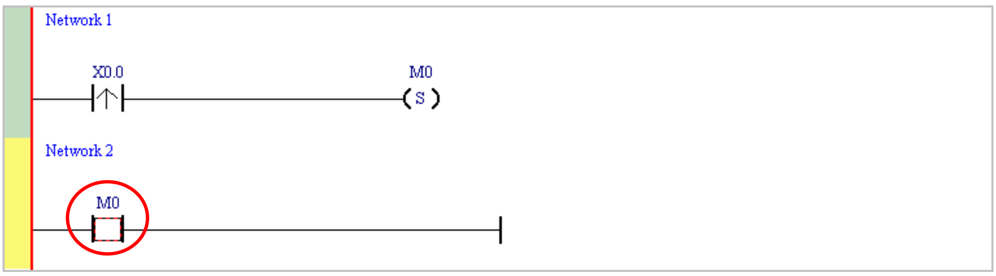
A contact and a coil can be created not only by clicking and on the toolbar, but also by typing instructions.

(1) Click the line in network 2.

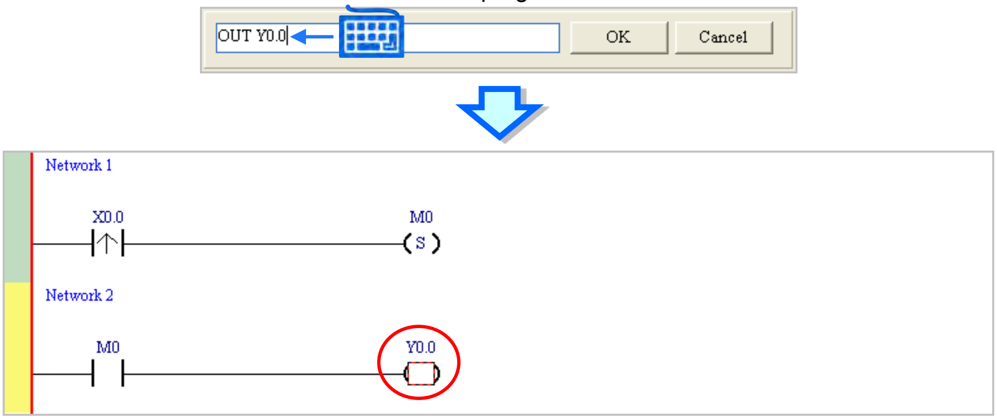


(2) Type the IL instruction "LD M0". (The instruction is case-insensitive.) As soon as the IL instruction is typed, a box which can be edited appears. After the typing of the IL instruction is complete, users can press Enter on the keyboard or click **OK** at the right side of the box.





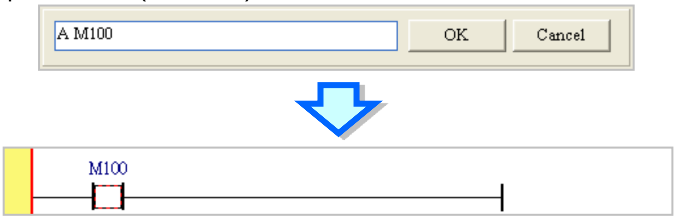
(3) Type the IL instruction “OUT Y0.0”, and write the program shown below.



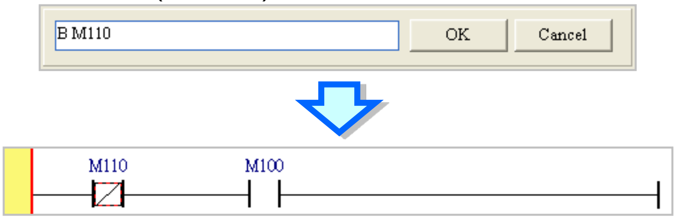
Additional remark

A contact and a coil can be created by typing simple instructions. Please refer to the description below. (The instructions typed are case-insensitive.)

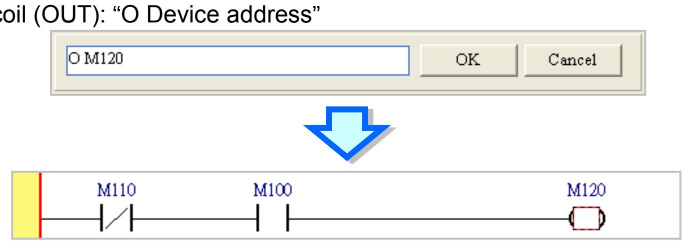
● Inserting a normally-open contact (contact A): “A Device address”



● Inserting a normally-closed contact (contact B): “B Device address”

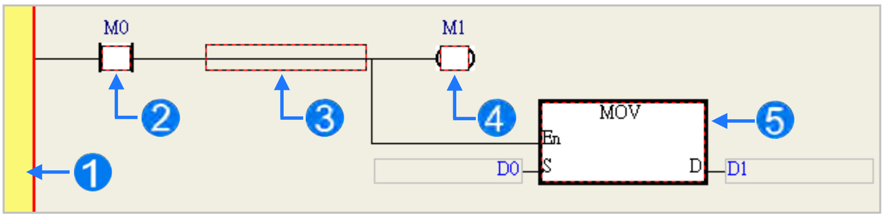


● Inserting an output coil (OUT): “O Device address”



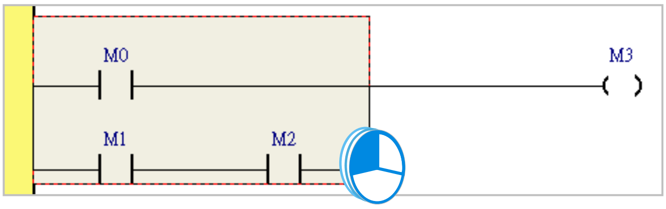
6.5.4 Basic Editing - Selection of a Network and Operation

Before an object in a network is selected, users have to press Esc on the keyboard, or click  on the toolbar. After the cursor appears as a small arrow, the users can click the object in the network. The basic selection is shown below.

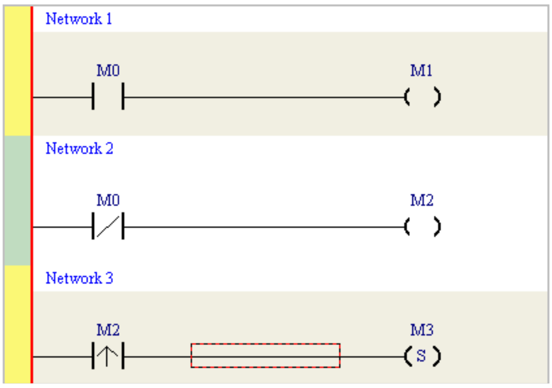


❶ Selecting the network
❷ Selecting the input contact
❸ Selecting the network
❹ Selecting the output coil
❺ Selecting the block

If users want to select a group of devices, they can click a device, and drag it to draw a frame round the group of devices. The users can also select the group of devices by clicking the first device, pressing Ctrl+B on the keyboard, clicking the last device, and pressing Ctrl+B on the keyboard. Users must draw a frame round devices which are in the same network, and the devices must be adjacent to one another. Besides, input devices and output devices can not be in the same frame.



If users want to select several networks, they can press Ctrl on the keyboard, and click the networks. The users can also select a range of networks by pressing Shift on the keyboard, clicking the first network within the range, and the last network within the range.



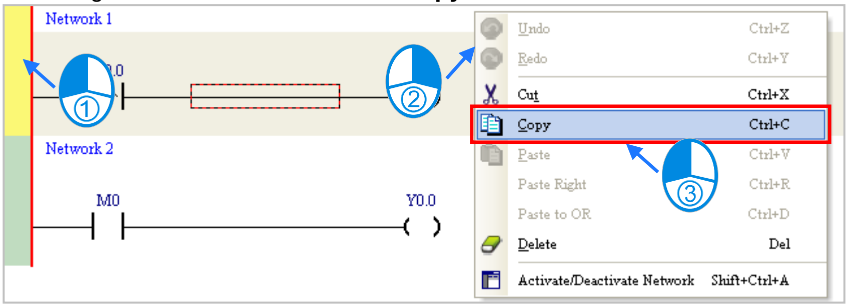
If users right-click an object after the object is clicked, they can click an item on the context menu.

Item	Function
Undo	Undoing the last action (The number of previous actions that can be undone is 20.)
Redo	Redoing an action which has been undone
Cut	Cutting a device, a block, or a network
Copy	Copying a device, a block, or a network
Paste	Paste an object which has been copied or cut on the present position
Paste right	Pasting an object at the right side of the position selected (The object will be connected to the position selected in series.)

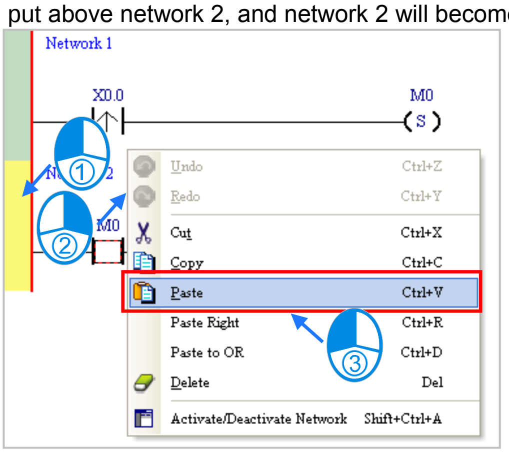
Item	Function
Paste under	Pasting an object under the position selected (The object will be connected to the position selected in parallel.)
Delete	Deleting a device, a block, or a network
Activate/Inactivate Network	Activating or Inactivating the network selected (The network which is inactivated is ignored when the program is compiled.)

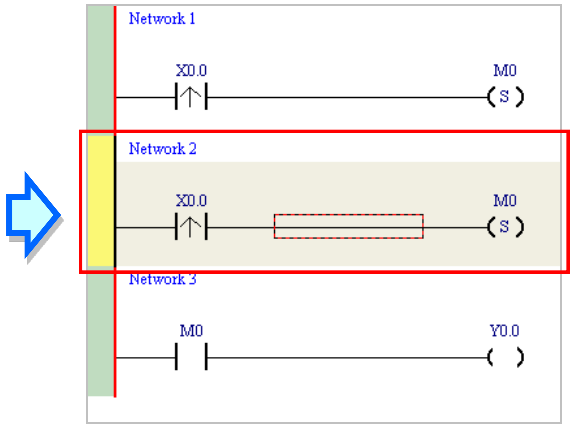
Users can proceed with the operation in the example.

(1) Select network 1, right-click network 1, and click **Copy** on the context menu.



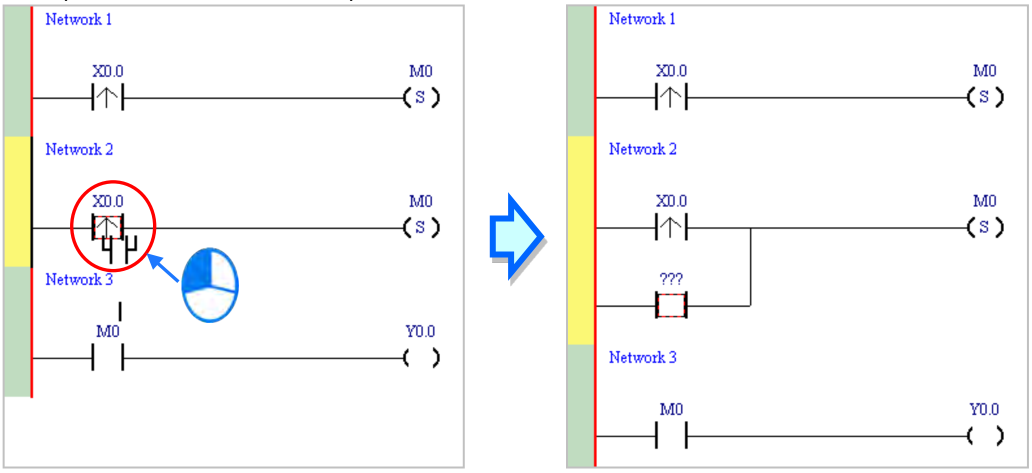
(2) Select network 2, right-click network 2, and click **Paste** on the context menu. A copy of network 1 will be put above network 2, and network 2 will become network 3.



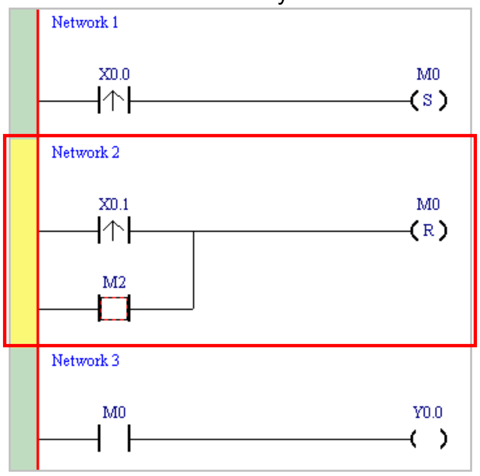


6.5.5 Basic Editing - Connecting a Contact in Parallel

(1) Click on the toolbar, and then move the mouse cursor to the input contact in network 2. The mouse cursor will appear as a contact. Move the mouse cursor to the button of the input contact in network 2. After the mouse cursor appears as , users can click the left mouse button. A contact will be connected to the input contact in network 2 in parallel.

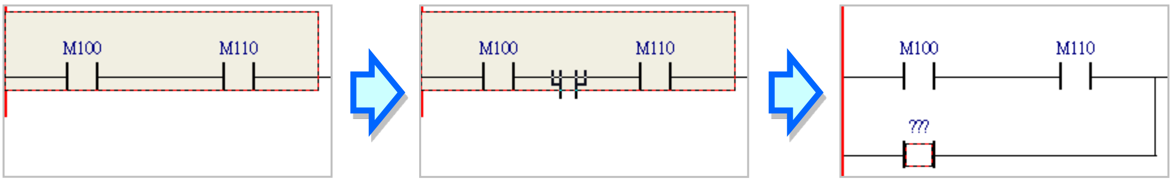


(2) Write the program in network 2 shown below in the way described above.



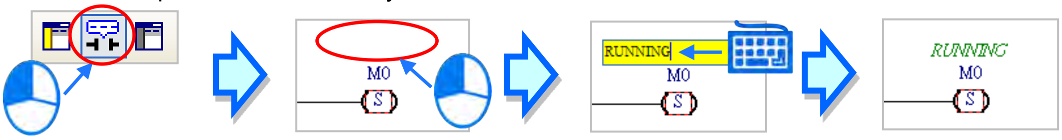
Additional remark

After users select a group of contacts, they can connect a contact to the group of contacts in the way described above.

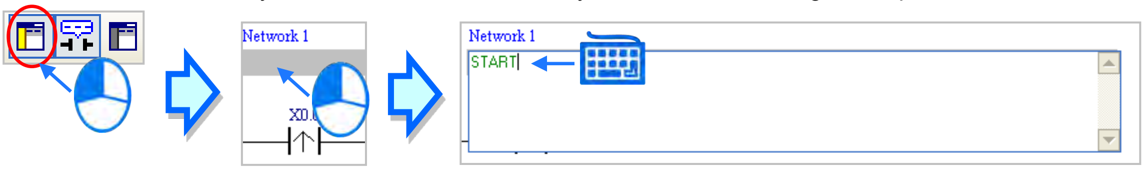


6.5.6 Basic Editing - Editing a Comment

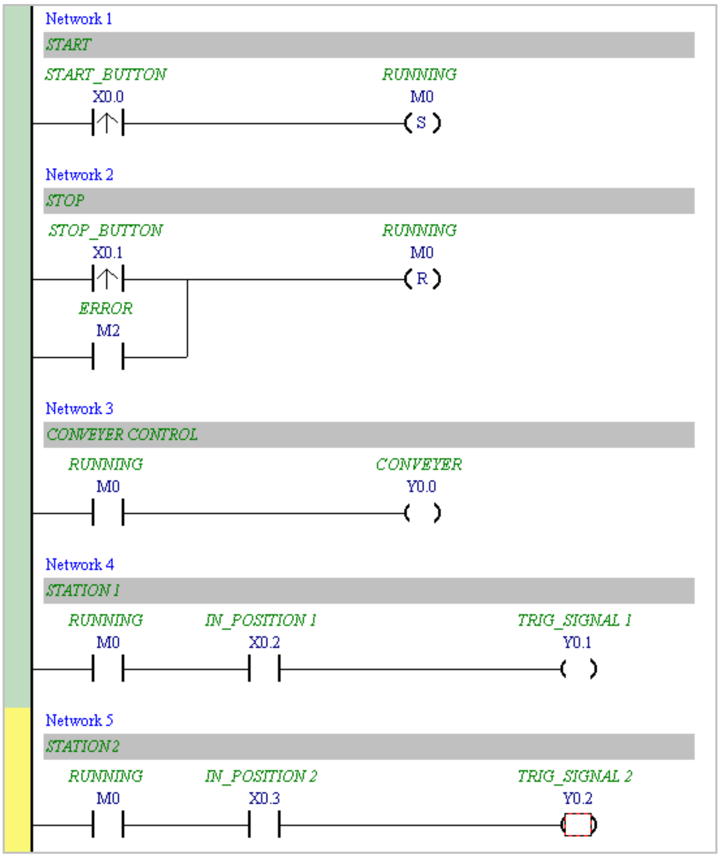
(1) Make sure that on the toolbar is pressed. Click the position above a device name, type a comment in the box, and press Enter on the keyboard.



(2) Make sure that on the toolbar is pressed. Click the position under a network number, and then type a comment in the box. If users want to start a new line of text at a specific point, they can press Shift+Enter on the keyboard. Press Enter on the keyboard after the editing is complete.

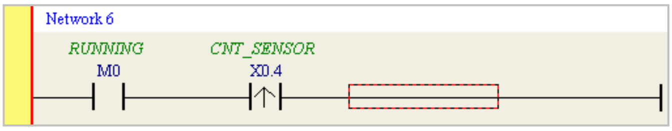


(3) Write the program shown below in the way described above.

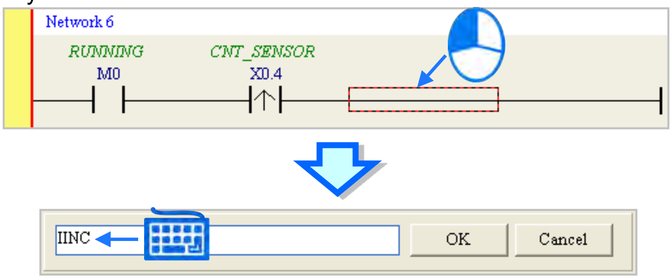


6.5.7 Basic Editing - Inserting an Applied Instruction

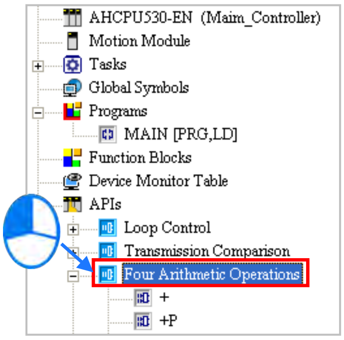
Put network 6 under network 5, and then write the program shown below. Users can insert an applied instruction in one of the three ways described below.



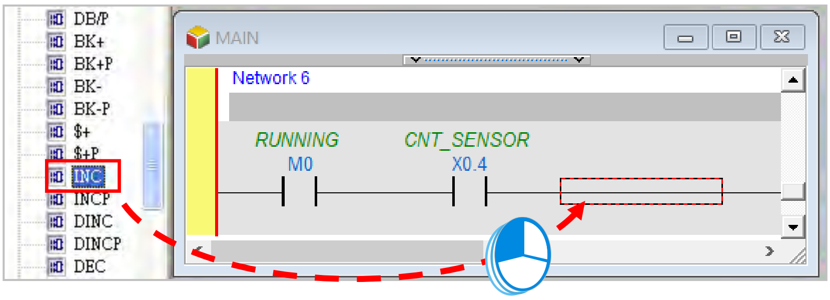
- Method 1
  Click the position where an instruction will be inserted, type the instruction (INC in this example), and press Enter on the keyboard.



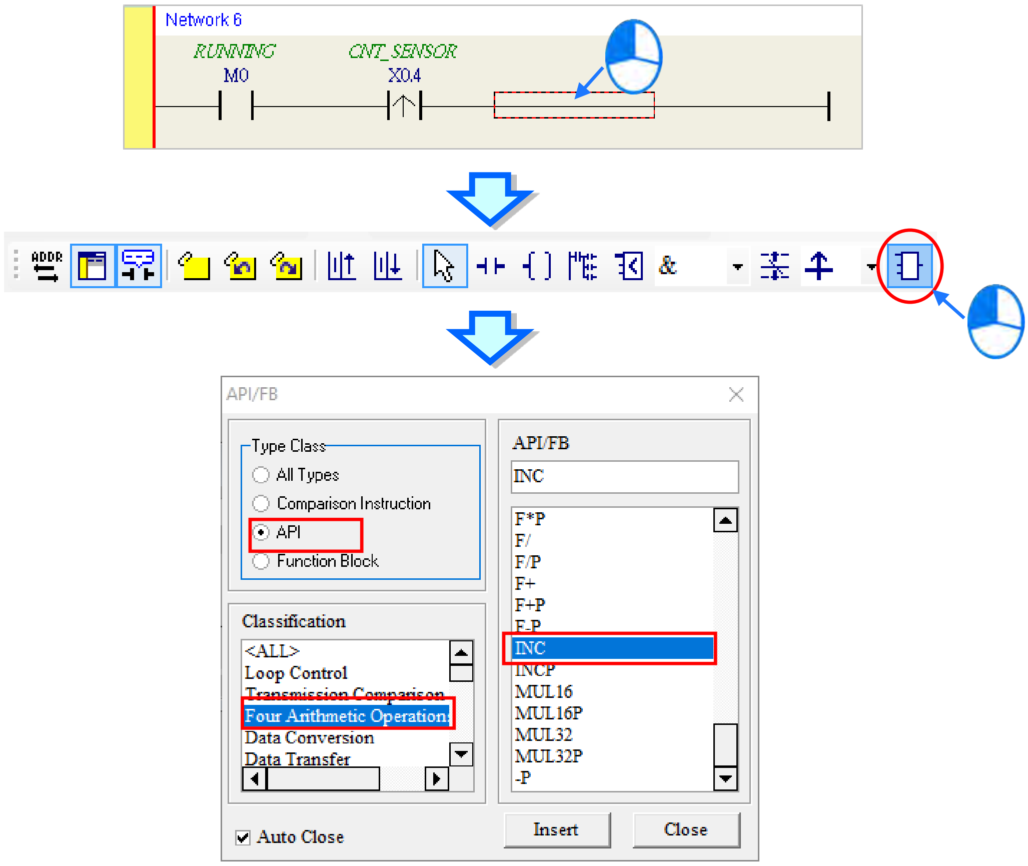
- Method 2
  Unfold the **APIs** section in the project management area, find the instruction type, and unfold the instruction type section.



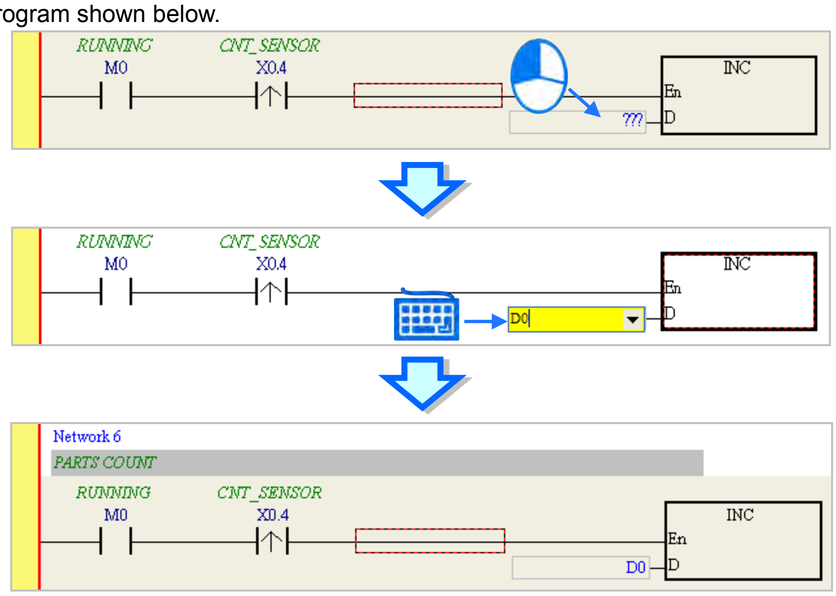
Select the instruction (INC in this example) which will be inserted, and then drag it to the position where it will be inserted.



- Method 3
  Click the position where an instruction will be inserted, click [icon] on the toolbar, select the instruction (INC in this example) which will be inserted in the **API/FB** window, and click **Insert**.

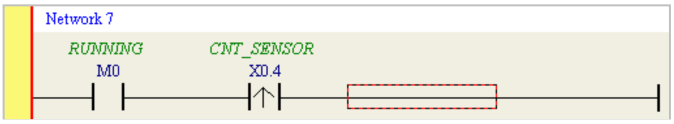


After the instruction is inserted successfully, the users can assign a device address to the operand, and write the program shown below.



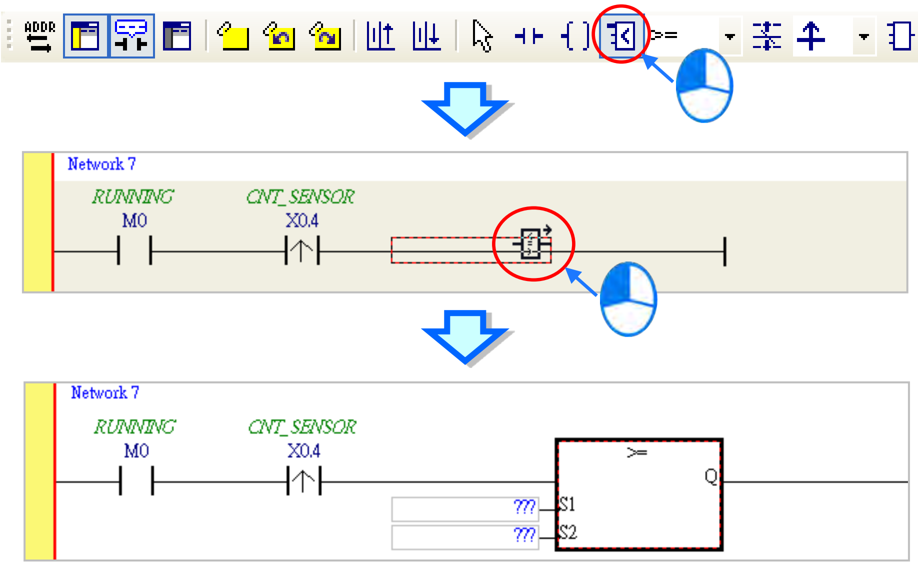
6.5.8 Basic Editing - Creating a Comparison Contact and Typing a Constant

A comparison contact can be inserted not only in one of the three ways described in section 6.5.7, but also by means of the following steps. Users need to put network 7 under network 6, and write the program shown below.

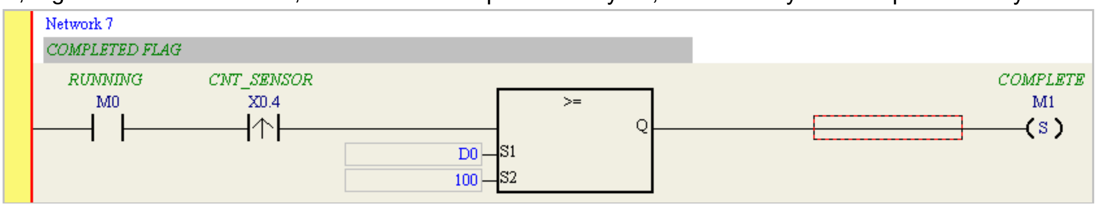


(1) Click & on the toolbar, and then select a type (>= in this example).

(2) Click on the toolbar, and then move the mouse cursor to the position where the comparison contact will be inserted. The mouse cursor appears as a comparison contact when the mosue is moved to the left side of the red frame, the right side of the red frame, or the bottom of the red frame. The users can decide where to insert the comparison contact. After the users decided on a position, they can click the left mouse button to insert the comparison contact.

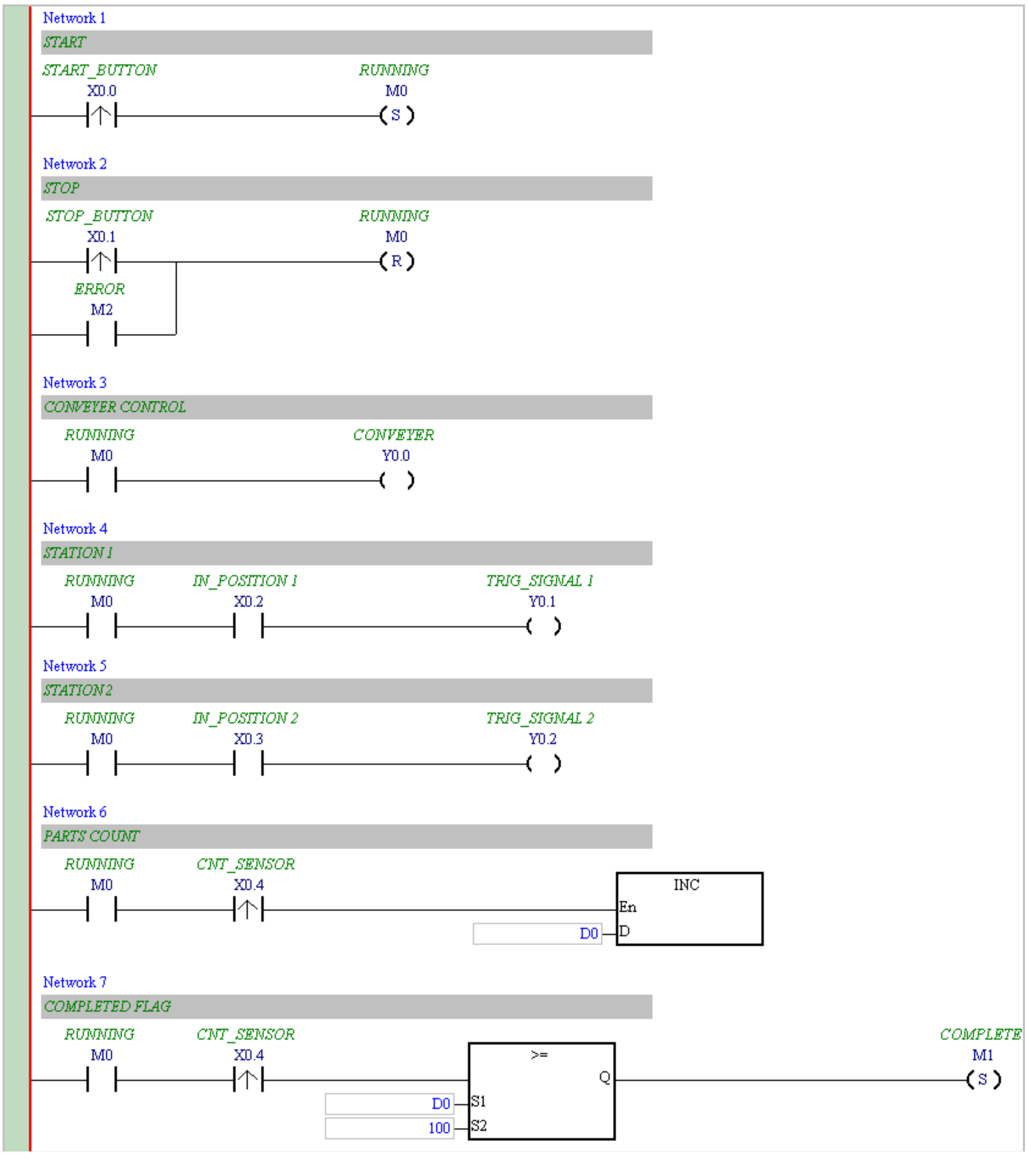


Write the program shown below in the way described above. In WPLSoft, a decimal value is preceded by K, and a hexadecimal value is preceded by H. If users want to type a decimal value in ISPSoft, they can type it directly. If users wan to type a hexadeicmal value in ISPSoft, they have to type “16#” and the hexadecimal value, e.g. 16#7FFF. In ISPSoft, an octal value is preceded by 8#, and a binary value is preceded by 2#.



6.5.9 Writing a Program

The creation of a traditional ladder diagram in ISPSoft has been introduced. Users can write the program shown below in the way described in the previous sections. Owning to the fact that the program has not been compiled, the mother line at the left side of the ladder diagram is red during the writing of the program. The following sections will introduce how to compile the program, and how to download the program which has been compiled to the CPU module to test the program.



***1. The program above is saved in the folder denoted by …\ISPSoft x.xx\Project\Example\Gluing_System_C.**

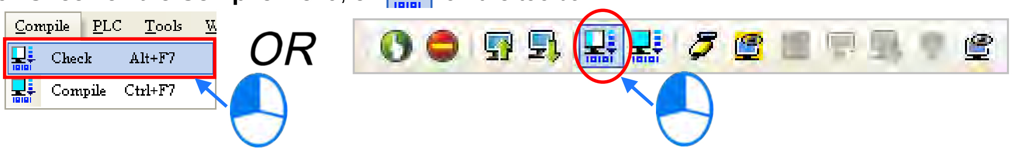
***2. Please refer to chapter 10 in ISPSoft User Manual for more information about creating a ladder diagram.**

6.5.10 Checking and Compiling a Program

After users write a program, they can check the syntax of the programming language or compile the program. The syntax and the structure in the present window will be checked after the **Check** function is enabled. The whole project will be checked after the **Compile** function is enabled. If there is no error in the project, an execution code will be generated automatically. After the program is compiled successfully, the mother line at the left side of the ladder diagram will become black.

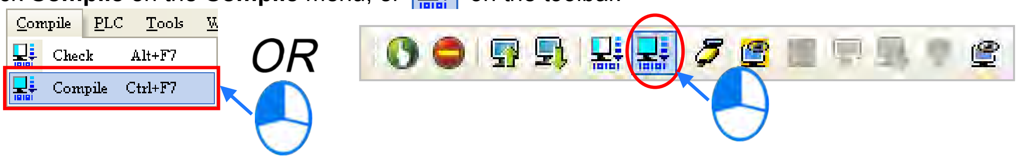
- **Check**

  Click **Check** on the **Compile** menu, or on the toolbar.

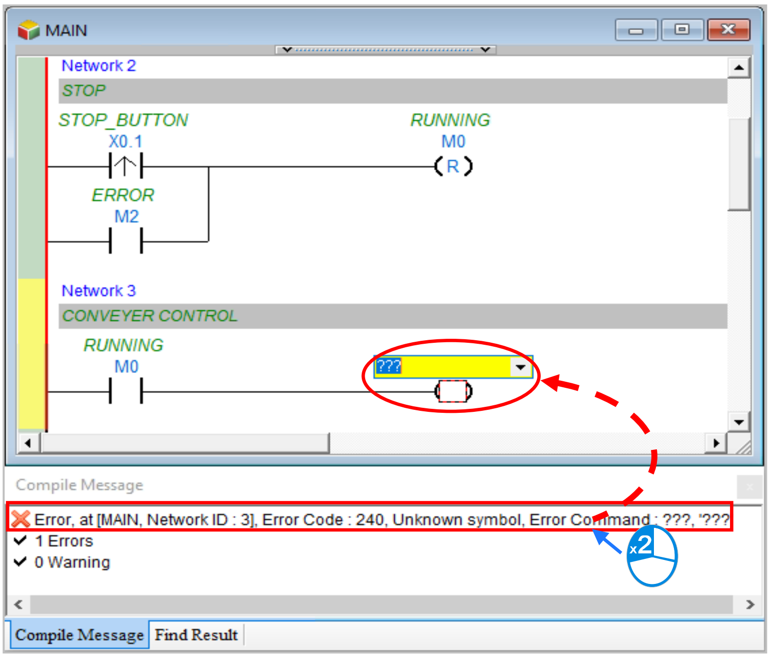


- **Compile**

  Click **Compile** on the **Compile** menu, or on the toolbar.



After the check is complete, the **Compile Message** page shows the result related to the check. If there is any error in the project, the **Compile Message** page will show the related message. After the message is clicked, the system will automatically lead users to the place where the error occurs. The users can enable the **Check** function or the **Compile** function after the error is eliminated.



6.6 Testing and Debugging a Program

6.6.1 Creating a Connection

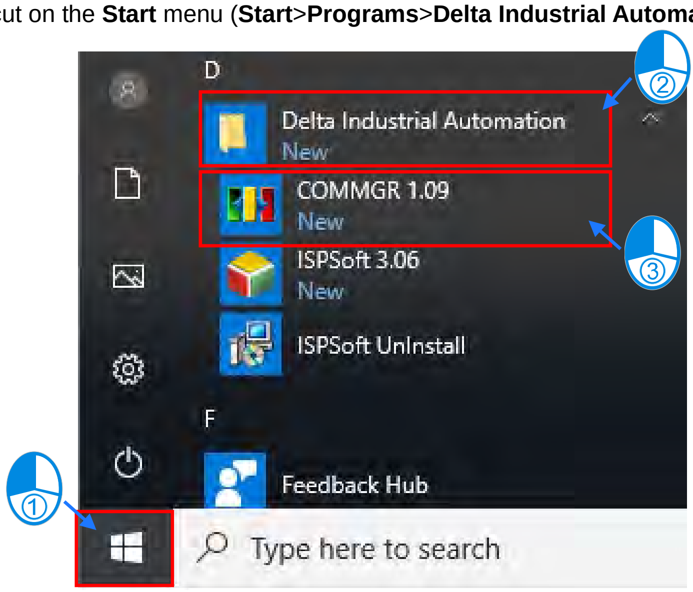
Before a program and parameters are downloaded to a PLC or monitored online, ISPSoft must be connected to the PLC. In this example, ISPSoft is connected to the CPU module AHCPU530-EN through a USB cable. Refer to section 6.6.2, if the connection to the CPU module has been established.

Those who have connected ISPSoft to a PLC successfully in accordance with the contents of section 2.4 in ISPSoft User Manual can skip this section.

(1) Install the modules on the main backplane in accordance with the hardware configuration in HWCONFIG. Make sure that the wiring is correct, and then power the CPU module.

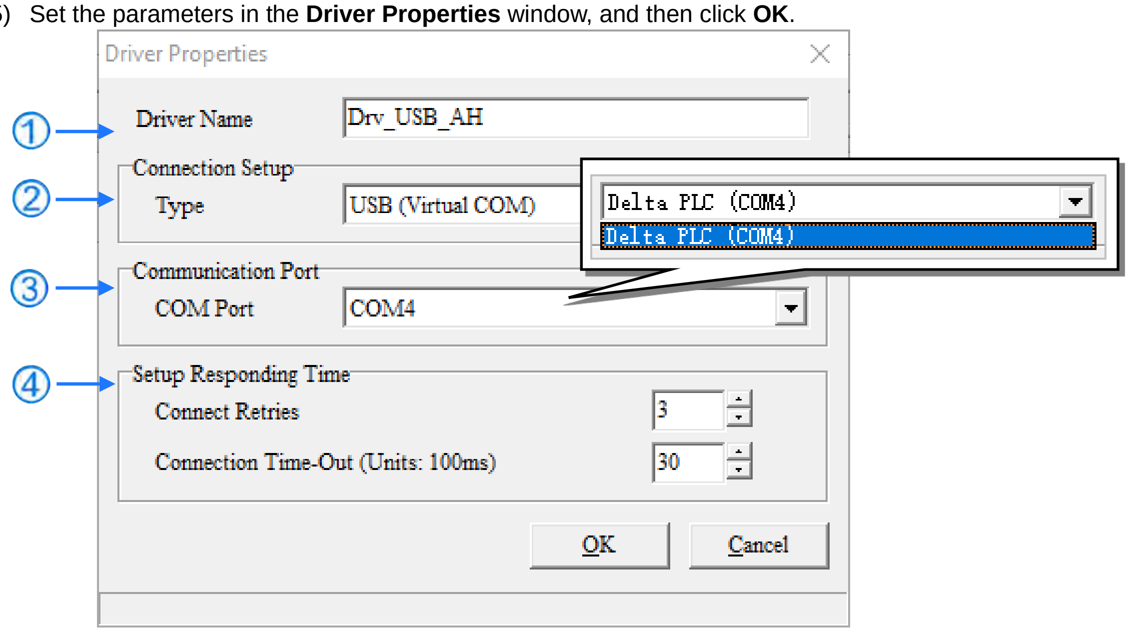
(2) Connect the CPU module to the computer through a USB cable. If the USB driver for the AH500 series CPU module has been installed on the computer, **Delta PLC** will appear in the **Device Manager** Window, and a port number will be assigned to **Delta PLC**. Please refer to appendix A for more information about installing a USB driver.

(3) Make sure that COMMGR is started, and the icon representing COMMGR is displayed on the system tray. If the icon representing COMMGR is not displayed on the system tray, users can start COMMGR by clicking the shortcut on the **Start** menu (**Start**>**Programs**>**Delta Industrial Automation**> **COMMGR)**.



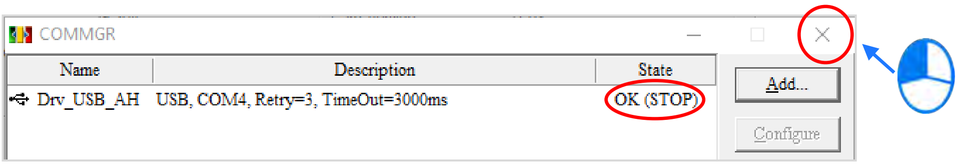
(4) Double-click the icon representing COMMGR on the system tray to open the **COMMGR** window. Click **Add** in the **COMMGR** window to create a driver.

(5) Set the parameters in the **Driver Properties** window, and then click **OK**.

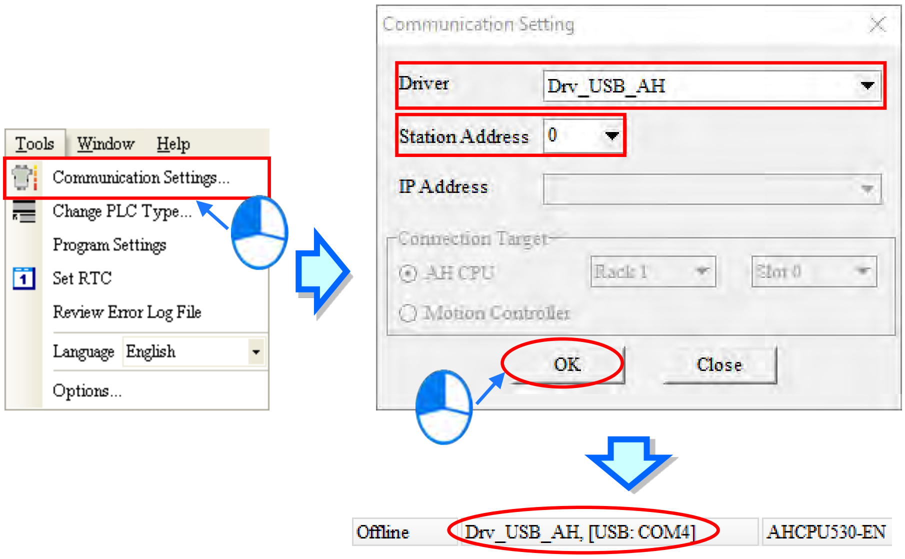


① Type a driver name in the **Driver Name** box.
② Select **USB (Virtual COM)** in the **Type** drop-down list box in the **Connection Setup** section.
③ Select a communication port in the **COM Port** drop-down list box. If the first two steps are complete, the PLC which is connected and its communication port will be displayed in the **COM Port** drop-down list box.
④ Users can select the number of times the sending of a command is retried if a connection error occurs in the **Connect Retries** box, and select an interval of retrying the sending of a command in the **Connection Time-Out** box.

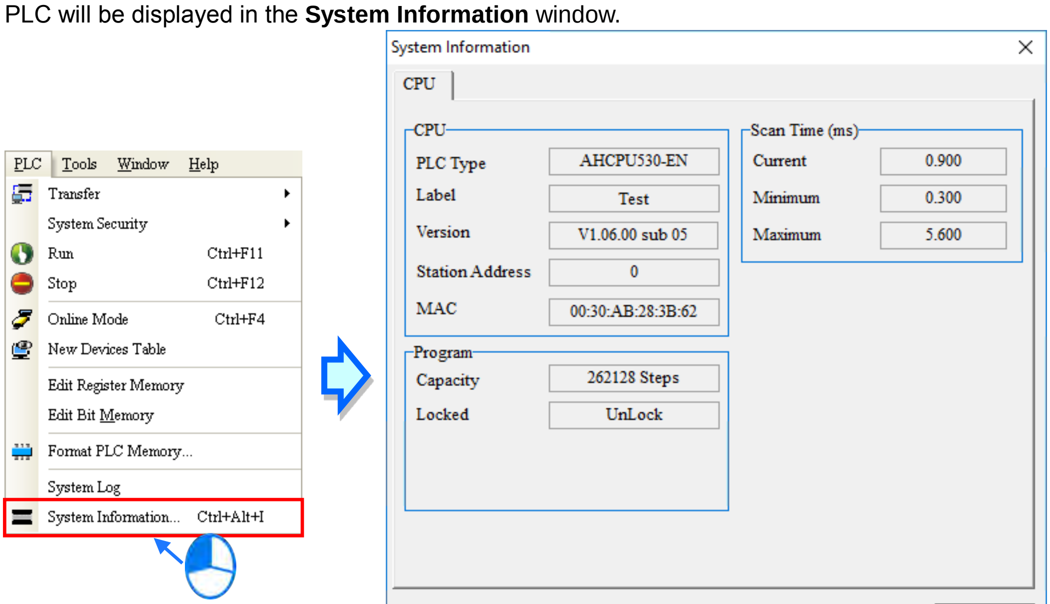
(6) Check if the Status of Driver is OK, if it is ok, you can close the window. COMMGR is still running in the Windows.



(7) Start ISPSoft, and then click **Communication Settings…** on the **Tools** menu. In the **Communication Setting** window, select the driver which has been created in the **Driver** drop-down list box, appear, and select 0 in the **Station Address** drop-down list box, and click **OK**. The information about the driver will be displayed in the status bar in ISPSoft.



(8) Click **System Information** on the **PLC** menu. ISPSoft will retrieve related information from the PLC. If the computer communicates with the CPU module normally, the related information retrieved from the PLC will be displayed in the **System Information** window.

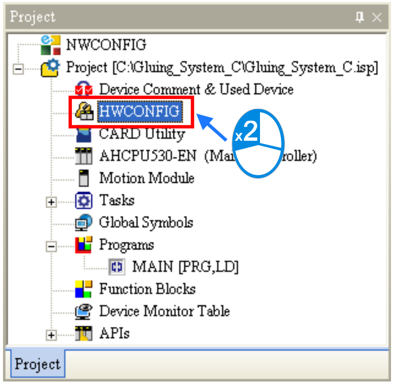


6.6.2 Downloading a Program and Parameters

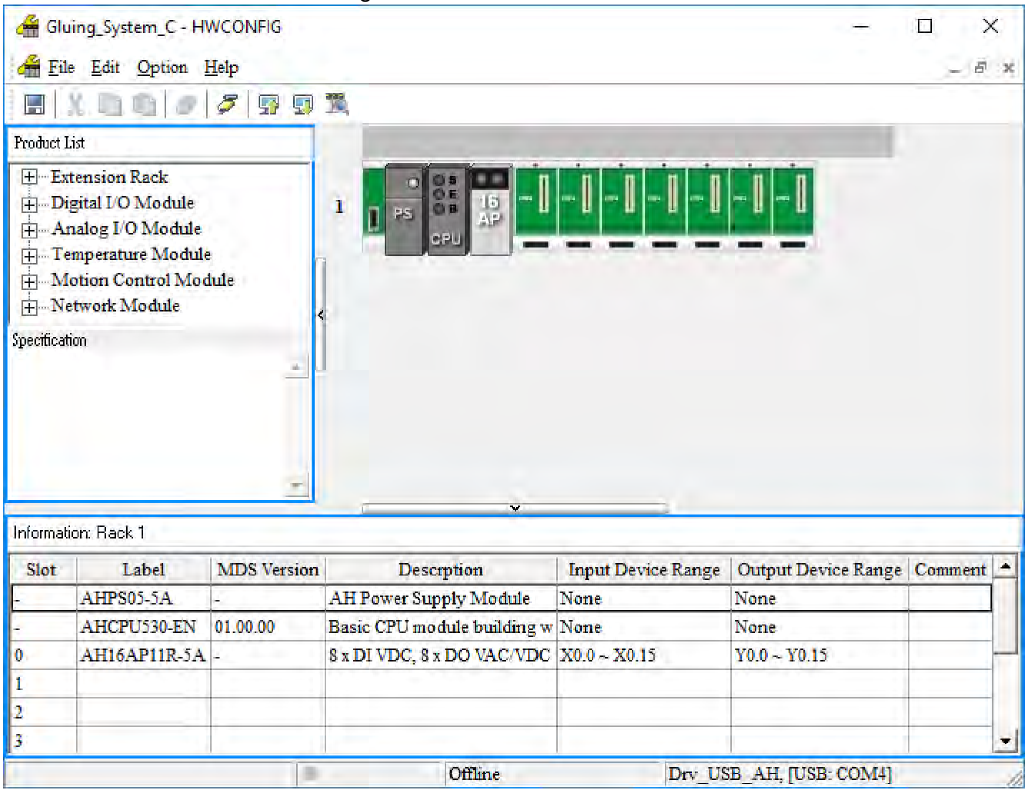
If ISPSoft is connected to a PLC normally, the parameters and the program in the project can be downloaded to the PLC. First, start ISPSoft and open the project created in the previous sections. In this example, two types of parameters are downloaded to the CPU module. They are the hardware configuration and the program.

- **Downloading the hardware configuration**

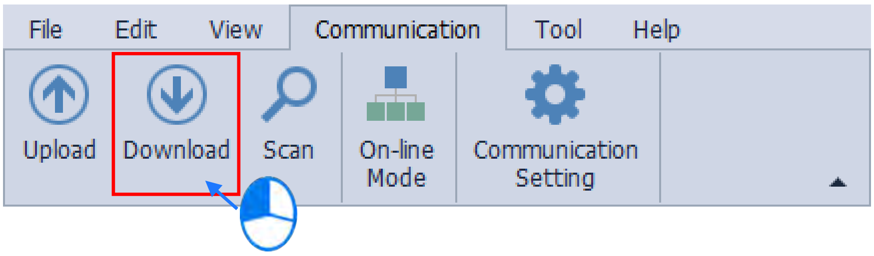
  (1) Double-click **HWCONFIG** in the project management area to open the **HWCONFIG** window.

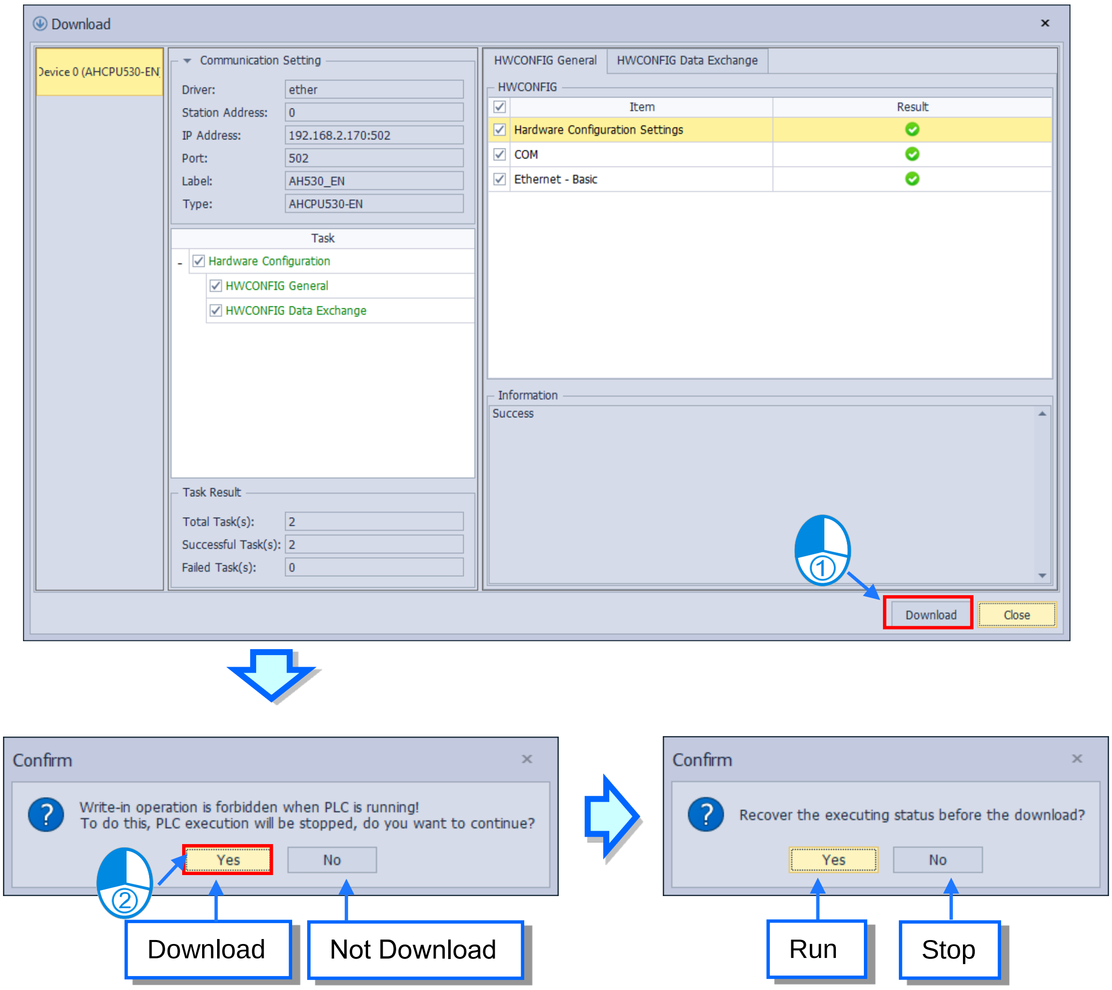


  (2) The hardware configuration is displayed in the window. Before the hardware configuration is downloaded to the CPU module, users have to make sure that the actual hardware configuration is the same as the hardware configuration in the window.



(3) After the users click Communication -> **Download** on the toolbar, the **Download** window will appear. Select the parameters that you need to download and click **Download**.

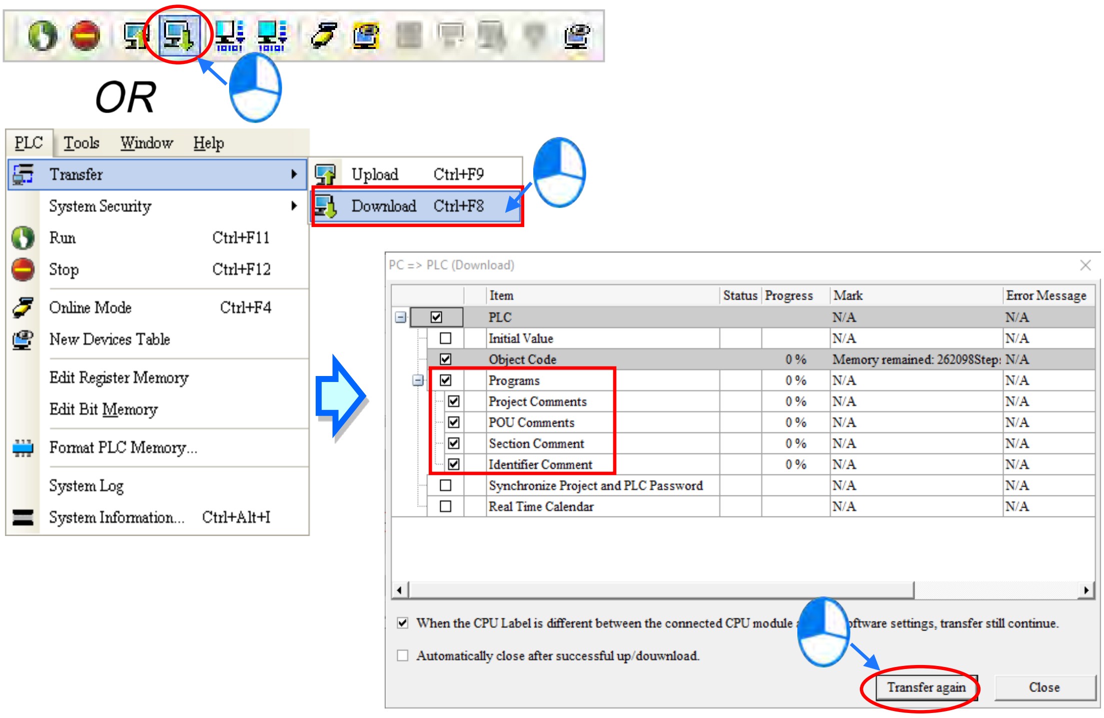




(4) After the hardware configuration is downloaded to the CPU module successfully, the BUS FAULT LED indicator on the CPU module will be OFF. The users can close the **HWCONFIG** window. If the BUS FAULT LED indicator on the CPU module is still ON or blinking, the CPU module is in an abnormal state. Please make sure that the actual hardware configuration is the same as the hardware configuration in the **HWCONFIG** window again, or refer to the operation manual for more information about eliminating the error. Please refer to chapter 8 for more information about HWCONFIG.

- **Downloading the program**

  After the program is compiled successfully, the users can click the **PLC** menu, point to **Transfer**, and click **Download**. The users can also click on the toolbar after the program is compiled successfully. Select the **Program** checkbox and the relative **Comments** checkbox in the **Transfer Setup** window so that the program in the CPU module can be uploaded later, and then click **OK**.



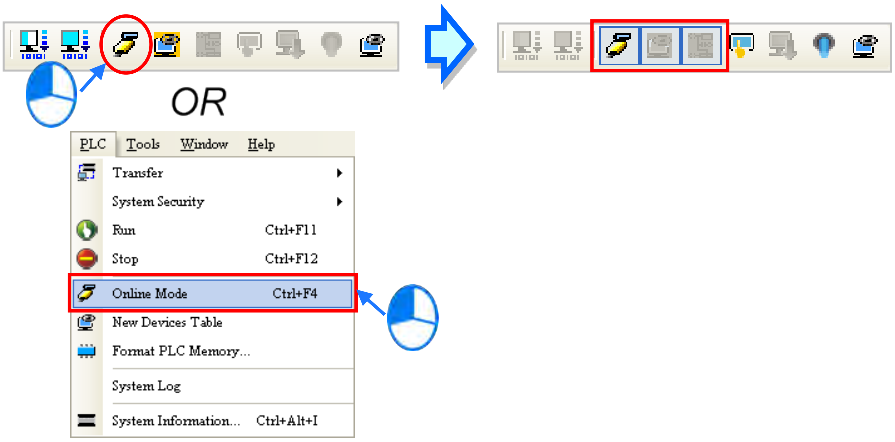
6.6.3 Connection Test

After a program is downloaded to a PLC, users can monitor the execution status of the PLC through ISPSoft. There are two monitoring modes that ISPSoft provide. One is the device monitoring mode, and the other is the program monitoring mode.

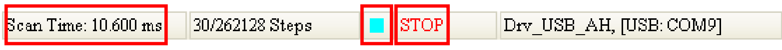
Monitoring mode	Description
Device monitoring mode	Users can monitor the statuses of the devices in the PLC through the monitoring table. In this mode, ISPSoft only needs to update the statuses of the devices. The present program in ISPSoft does not need to be the same as the program in the PLC.
Program monitoring mode	In this mode, the operating status of the program is displayed in the program editing window. As a result, the present program in ISPSoft must be the same as the program in the PLC.

***. The device monitoring function can be enabled independently. However, if the program monitoring function is enabled, the device monitoring function is also enabled.**

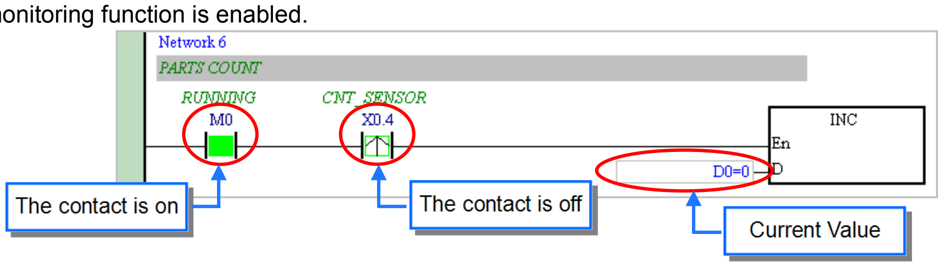
After users click **Online Mode** on the **PLC** menu, or on the toolbar, the online monitoring function will be enabled. The system will also enable the device monitoring mode and the program monitoring mode.



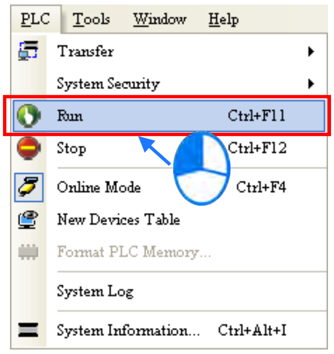
In the online monitoring mode, users can view the present scan time, the communication status, and the status of the PLC in the status bar in ISPSoft.



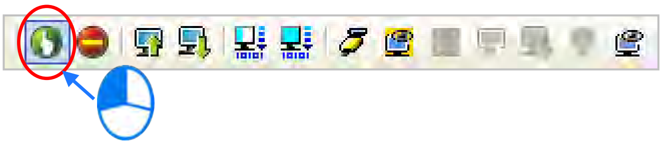
Besides, the present statuses of the devices will be displayed in the original program editing window after the program monitoring function is enabled.



Users can change the operating status of a PLC by the RUN/STOP switch on the PLC. They can also change the operating status of the PLC through the functions provided by ISPSoft. After users click **Run** on the **PLC** menu or on the toolbar, the PLC will begin to run. The PLC will stop running after **Stop** on the **PLC** menu or on the toolbar is clicked.

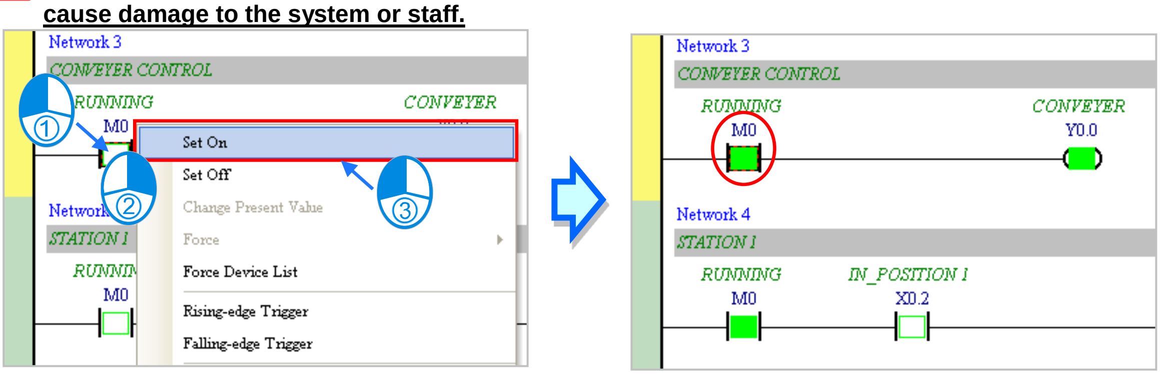


OR



In the online monitoring mode, users can select a device, right-click the device, and click an item on the context menu. During a test, users can change the status of a device or the value in a device by clicking an item on the context menu.

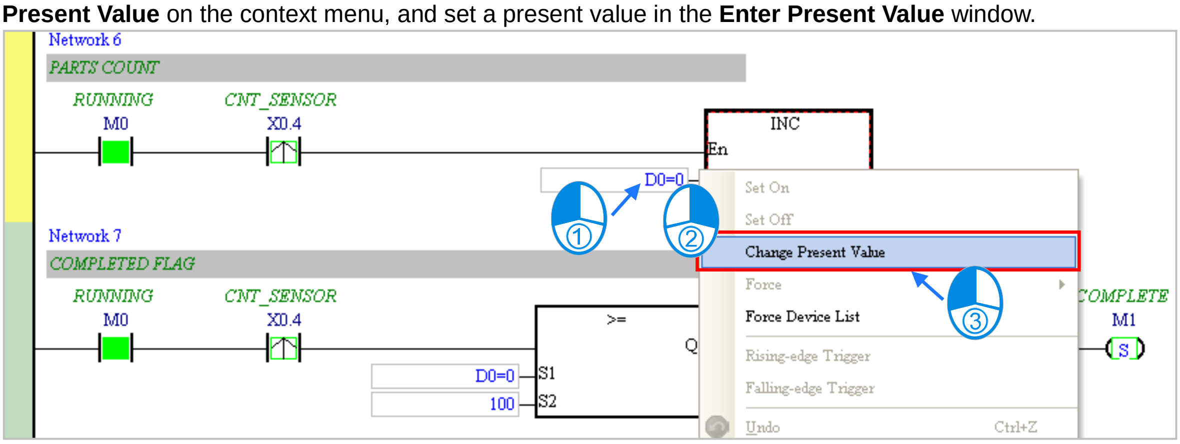
⚠ **Before the status of a device is changed, users have to make sure that the operation does not cause damage to the system or staff.**



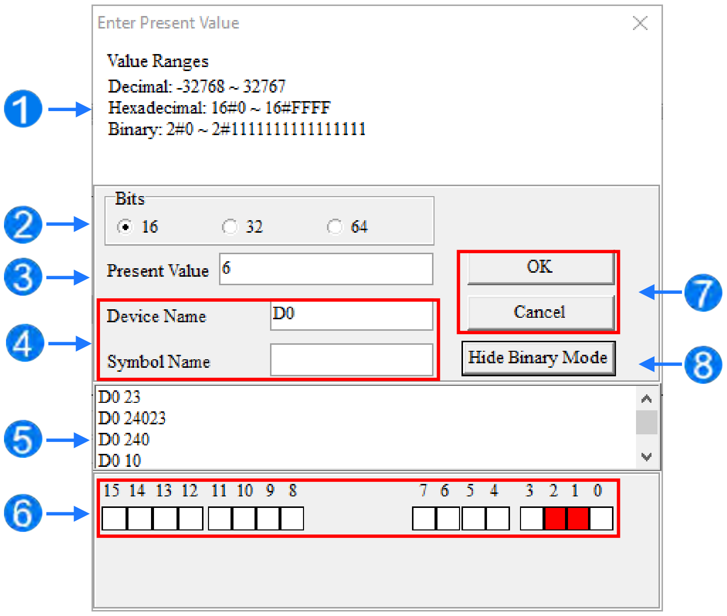
The items on the context menu are described below. **Force** on the context menu only applies to input contacts and output contacts.

Item	Description
Set On	Setting the contact selected to ON
Set Off	Setting the contact selected to OFF
Rising-edge Trigger	No matter what the state of the contact selected is, the system set the contact to OFF, and then set it to ON.
Falling-edge Trigger	No matter what the state of the contact selected is, the system set the contact to ON, and then set it to OFF.
Force	Forcing an input contact or output contact ON or OFF
Force Device List	Forcing several input contacts or output contacts in the tables ON or OFF

If users want to change the value in a device, they can click the device, right-click the device, click **Change Present Value** on the context menu, and set a present value in the **Enter Present Value** window.

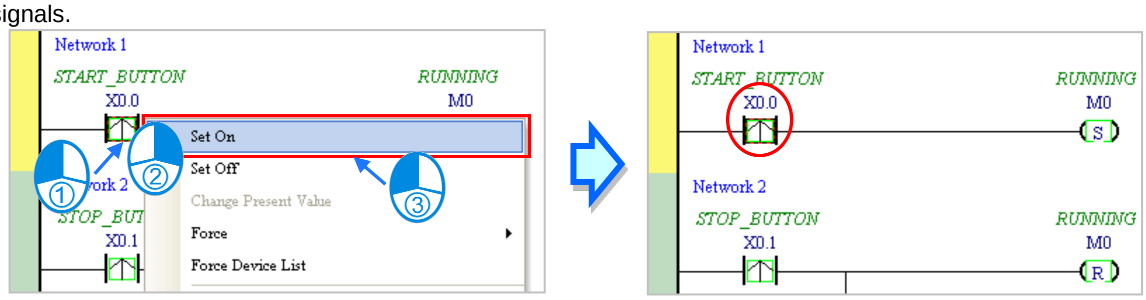


The **Enter Present Value** window is described below.

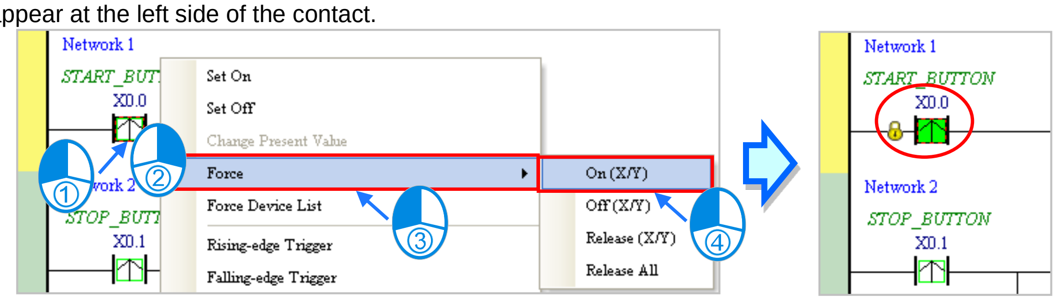


❶ Message
❷ Users can type a 16-bit, a 32-bit or a 64-bit value.
❸ Users can type a value in the **Present Value** box.
❹ Users can define the device name and symbol name.
❺ Value change history (Format: Device name Value)
❻ In the binary mode, users can set the states of the bits through the mouse.
❼ The setting values will be applied after **OK** is clicked. The window will be closed after **Cancel** is clicked.
❽ Users can display or hide the binary mode.

In this example, X0.0~X0.15 and Y0.0~Y0.15 are input devices and output devices assigned to the digital I/O module AH16AP11R-5A. After the parameters in the hardware are downloaded to the CPU module, the states of X0.0~X0.15 will be the same as the states of the inputs on the actual module. Even if users set X0.0~X0.15 to ON or OFF in the program editing window, the states of X0.0~X0.15 will be updated by the actual input signals.



However, an input contact can be forced ON or OFF during a test. Users can click an input contact or output contact which will be set, right-click the contact, point to **Force** on the context menu, and select **On (X/Y)**, **Off (X/Y)**, **Release (X/Y)**, or **Release All**. If an input contact or output contact is forced ON or OFF, a lock symbol will appear at the left side of the contact.



Force	Description
On (X/Y)	Forcing the input contact or output contact selected ON
Off (X/Y)	Forcing the input contact or output contact selected OFF
Release (X/Y)	Releasing the contact from the locked state
Release All	Releasing all the contacts from the locked states

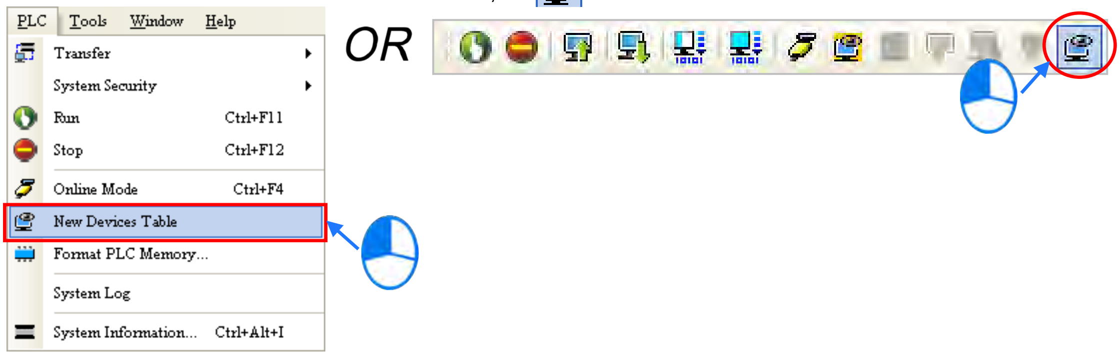
If an output contact in the program is forced ON or OFF, the output state of this contact will not be affected by the program execution result.

***. If the online monitoring function is disabled, the contacts will not be automatically released from the locked states. As a result, users have to check whether the contacts need to be released from the locked states after the test is complete.**

There are two ways to create a monitoring table. Users can create a monitoring table online or offline.

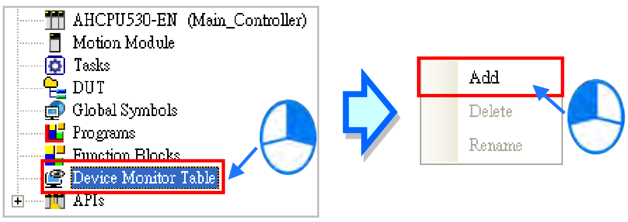
- **Method 1**

  Click **New Devices Table** on the **PLC** menu, or on the toolbar.

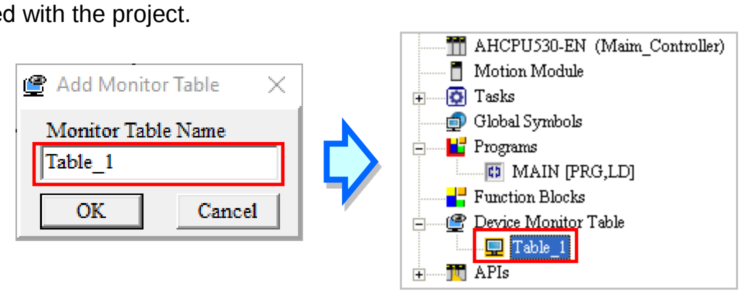


- **Method 2**

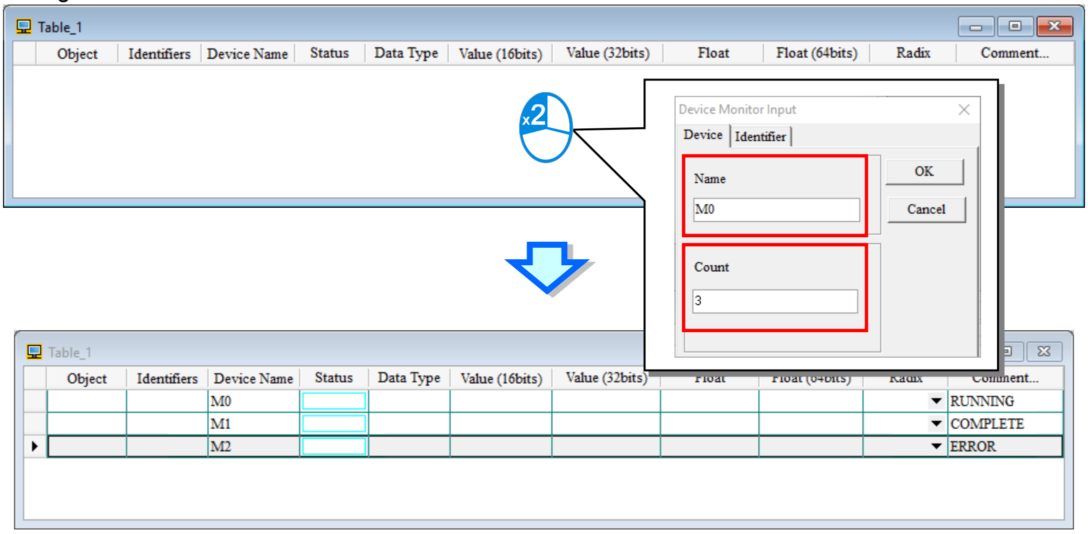
  Right-click **Device Monitoring Table** in the project management area, and click **Add**.



Type a table name in the **Add Monitor Table** window, and then click **OK**. An item will be under **Device Monitor Table** in the project management area. If users want to open the monitoring table, they can double-click the item. Besides, the users can create several monitoring tables in the project, and the monitoring tables created will be saved with the project.

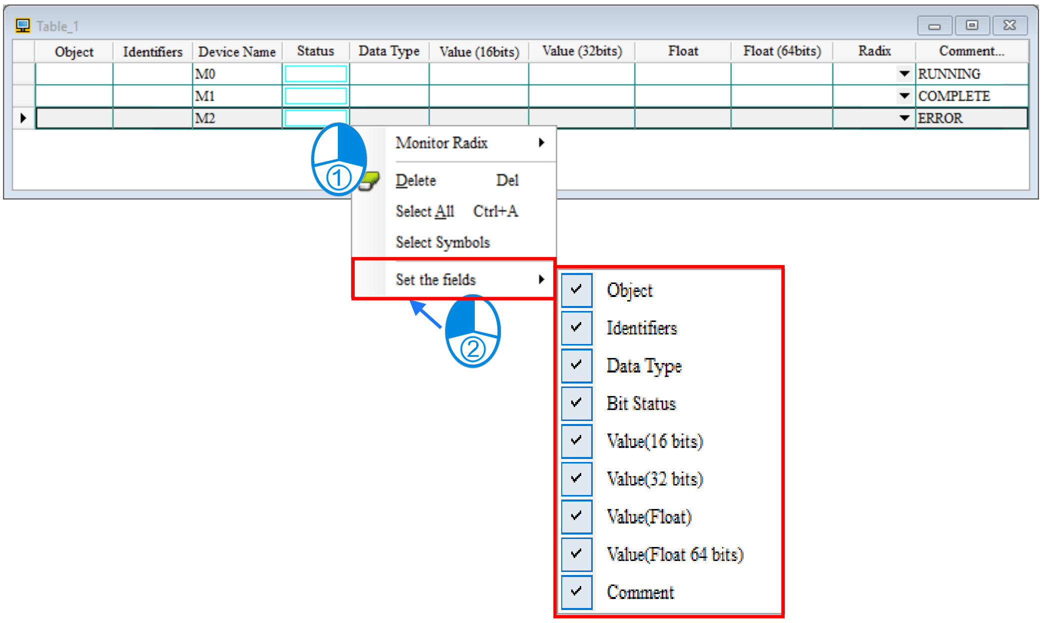


After the item is double-clicked, a window will appear. The users can add items which will be monitored to the window. If the users want to add an item to the window, they have to double-click the blank in the monitoring table, or type a device name directly, and type a start address and the number of devices which will be monitored in the **Device Monitor Input** window. Please notice that 100 items at most can be added to a monitoring table.



The users can press Insert on the keyboard to switch between inserting an item in the monitoring table and replacing an item in the monitoring table. The mode which is selected is displayed in the status bar in ISPSoft. If the insertion mode is selected, the item added will be above the item selected in the monitoring table. If the replacement mode is selected, the item added will overwrite the item selected in the monitoring table.

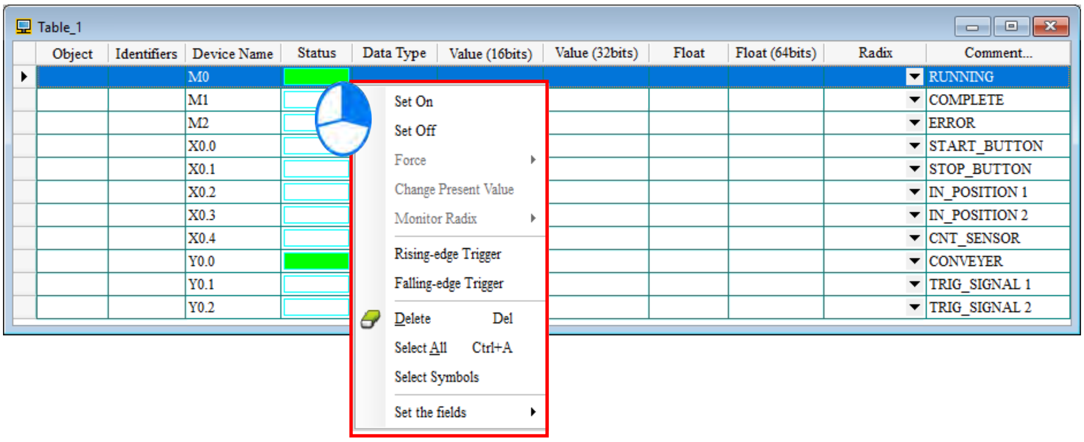
If the users want to hide certain columns in the monitoring table, they can right-click the monitoring table, point to **Set the Fields**, and unselect certain items. After an item is unselected, the corresponding column will disappear.



The description of the columns in the monitoring table is as follows.

Column	Description
Source	The source of a symbol
Identifier	The identifier of a symbol
Device name	The name of a device monitored
Status	If a bit device or a contact is monitored, the state will be ON or OFF.
Data type	If a symbol is monitored, the data type of the symbol will be displayed.
Value (16 bits)	In the online mode, a 16-bit value is displayed.
Value (32 bits)	In the online mode, a 32-bit value is displayed.
Float (32 bits)	In the online mode, a 32-bit floating-point number is displayed.
Float (64 bits)	In the online mode, a 64-bit floating-point number is displayed.
Radix	Users can select a format in which a value is represented.
Comment	The comments on a device or the comment on a symbol is displayed.

After the monitoring table is created, the users can monitor the items in the monitoring table in the online mode. Besides, after the users right-click an item in the monitoring table in the online mode, a context menu which is the same as the context menu which will after a device in the program editing window is clicked will appear. The users can change the state of the item or the value in the item by clicking an item on this context menu.

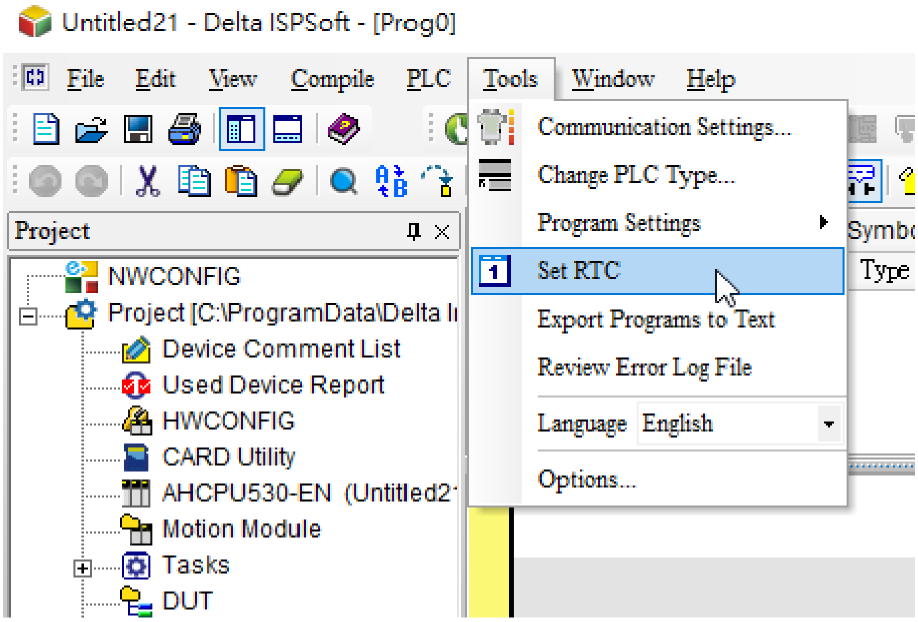


The program created in this chapter can be tested and debugged through the monitoring table created in this section. Please refer to chapter 18 in ISPSoft User Manual for more information about testing and debugging a program.

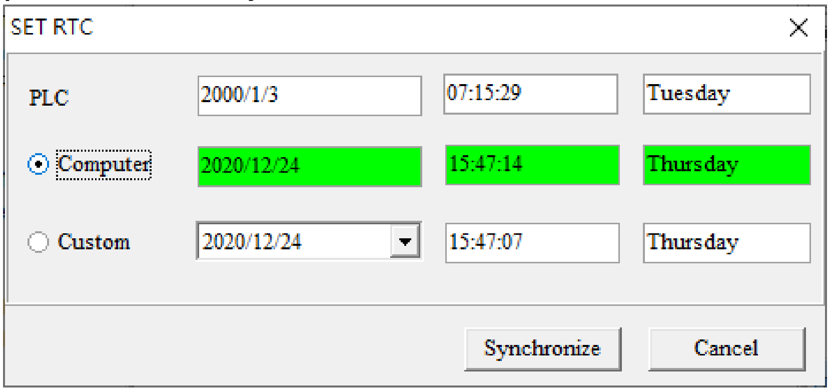
6.7 Setting a Real-time Clock

After an AH500 series CPU module is connected to a computer, users can set the real-time clock in the CPU module through ISPSoft.

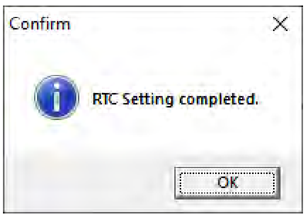
(1) Click **Set RTC** on the **Tools** menu.



(2) Select **Computer**, and then click **Synchronize**.



(3) The setting of the real-time clock is complete.



MEMO

Chapter 7 Memory Card

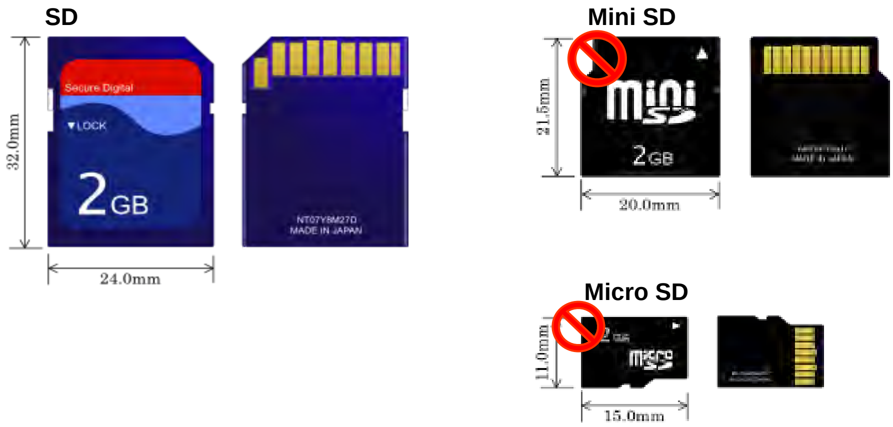
Table of Contents

7.1 Overview of Memory Cards

The AH500 series CPU modules support standard SD cards. Users can purchase products which meet specifications. The specifications for the SD cards supported by the AH500 series CPU modules, and the usage of the SD cards are described in this chapter.

7.1.1 Appearances of Memory Cards

SD cards are classified into three types according to size. They are SD cards, miniSD cards, and microSD cards. The AH500 series CPU modules support standard-sized SD cards.



7.1.2 Specifications for SD Cards

There are several specifications for SD cards on the market. SD cards not only can be classified according to size, but also can be classified into three types according to capacity. These types are SD cards, SDHC cards, and SDXC cards. The AH500 basic series CPU modules presently support SD cards up to 2GB and the AH500 advanced series CPU modules presently support SDHC cards up to 32GB. The following is the table of SD card families. The SD column indicates the specifications supported by the AH500 basic series CPU modules and the SDHC column indicates the specifications supported by the AH500 advanced series CPU modules. Be sure to purchase products which meet the specifications.

- The SD card families

<table>
<tr><th></th><th>AH500 Basic / Advanced CPU</th><th colspan="3">AH500 Advanced CPU</th><th colspan="2">--</th></tr>
<tr><td>Type</td><td>SD</td><td colspan="3">SDHC</td><td colspan="2">SDXC</td></tr>
<tr><td>Capacity</td><td>32MB~2GB</td><td colspan="3">4GB~32GB</td><td colspan="2">32GB~2TB</td></tr>
<tr><td>File system</td><td>FAT16/FAT32</td><td colspan="3">FAT32</td><td colspan="2">exFAT（FAT64）</td></tr>
<tr><td>Size</td><td>SD</td><td>SDHC</td><td>Mini SDHC</td><td>Micro SDHC</td><td>SDXC</td><td>Micro SDXC</td></tr>
<tr><td>Speed class rating</td><td>N/A</td><td colspan="3">CLASS 2 (Min. 2MB/Sec.)
CLASS 4 (Min. 4MB/Sec.)
CLASS 6 (Min. 6MB/Sec.)
CLASS 10 (Min. 10MB/Sec.)</td><td colspan="2">CLASS 2 (Min. 2MB/Sec.)
CLASS 4 (Min. 4MB/Sec.)
CLASS 6 (Min. 6MB/Sec.)
CLASS 10 (Min. 10MB/Sec.)</td></tr>
</table>

* MMC cards are similar to SD cards in appearance. Users have to make sure that they purchase products which meet the specifications.

7.2 Using a Memory Card

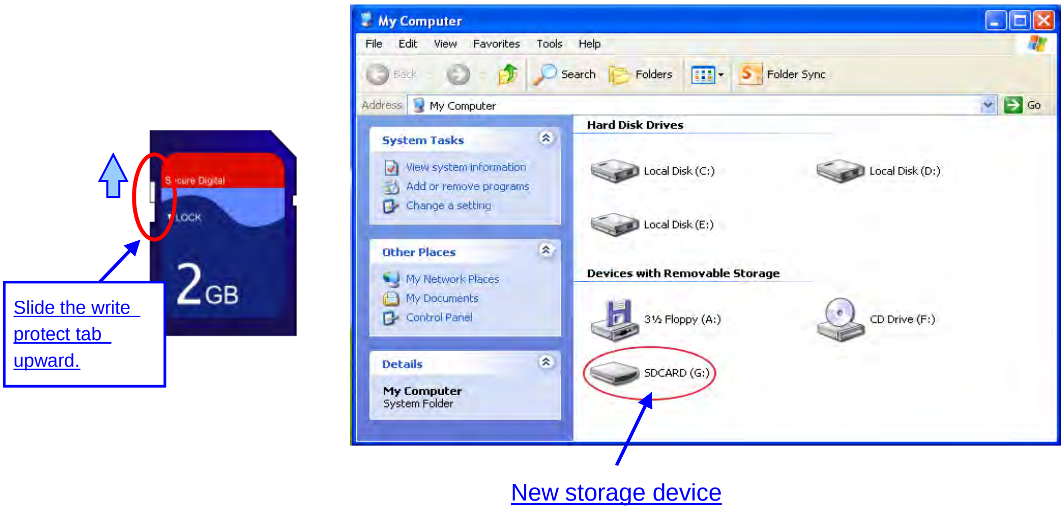
7.2.1 Formatting a Memory Card

A memory card that users use for the first time may not be formatted. A memory card which is not formatted can not be used in an AH500 series CPU module. Therefore, users need to format the memory card. The file system with which the memory card is formatted is FAT.

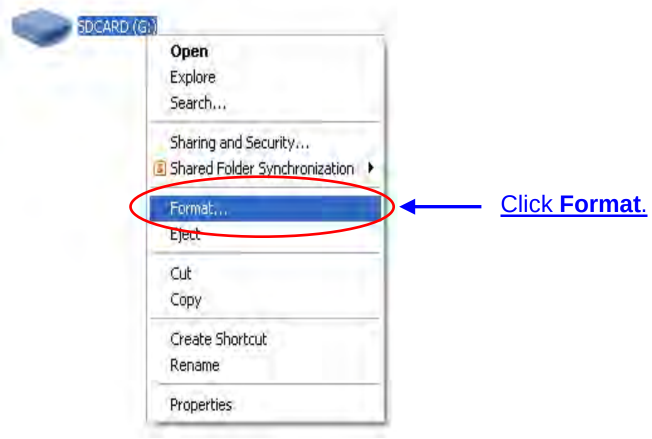
The following example introduces the most common way to format an SD card, that is, formatting an SD card through a card reader. However, users still need to read the documents provided by the SD card manufacturer carefully.

⚠ If a memory card is formatted, all the data in the memory card will be deleted. Users have to check whether the data in a memory card needs to be backed up before they format the memory card.

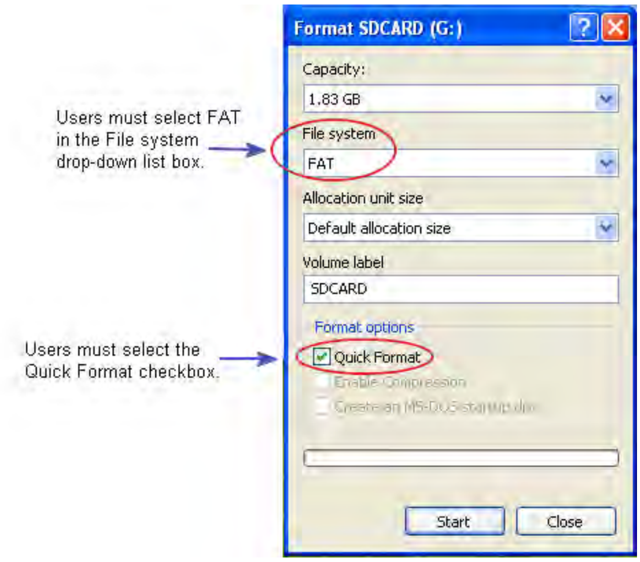
(1) Slide the write protect tab on the left side of the memory card upward, and then insert it into a card reader. The operating system detects a new storage device.



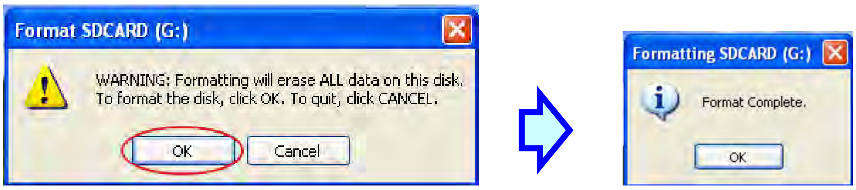
(2) Right-click the new storage device, and then click **Format**.



(3) The file system with which the memory card is formatted must be FAT. The other default setting is retained. Click **Quick Format**, and then click **Start**.



(4) After **OK** in the warning window is clicked, the SD card is formatted.



7.2.2 Write Protect Function of a Memory Card

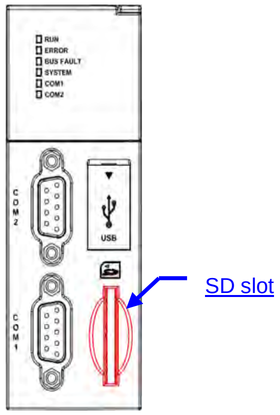
There is usually a write protect tab on the left side of a memory card. If the tab is slid downward, data can not be written into the memory card. As a result, users have to make sure that the tab is slid upward before they use the memory card.

7.3 Installing and Removing a Memory Card

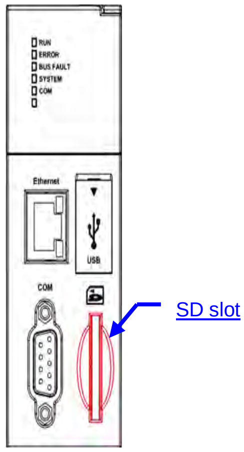
7.3.1 SD Slot in a CPU Module

As shown below, the SD slot is in the lower right corner of the front of a CPU module.

AHCPU5X0-RS/ AHCPU5X1-RS

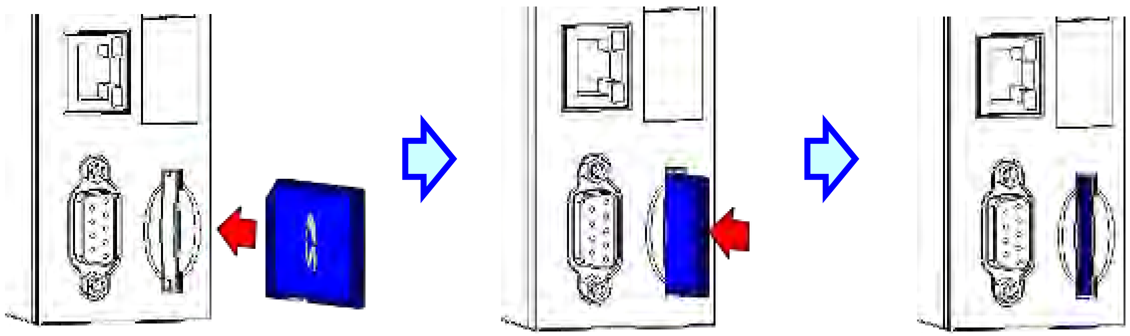


AHCPU5X0-EN/ AHCPU5X1-EN



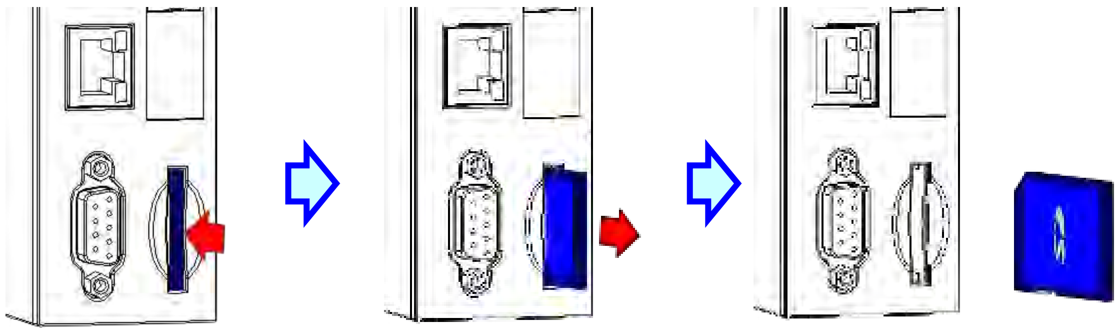
7.3.2 Installing a Memory Card

Insert a memory card into the SD slot in a CPU module, and push it downward until it clicks. After the memory card is installed, it is fixed firmly in the slot. If the memory card is loose, it is not installed correctly. Besides, the memory card has anti-misinsertion design. If it is inserted in the wrong direction, it can not be pushed downward. To prevent the CPU module from being damaged, users can not force the memory card in. The correct way to insert the memory card is shown below.



7.3.3 Removing a Memory Card

After a memory card is pushed downward, it springs from the slot, and users can take it out.



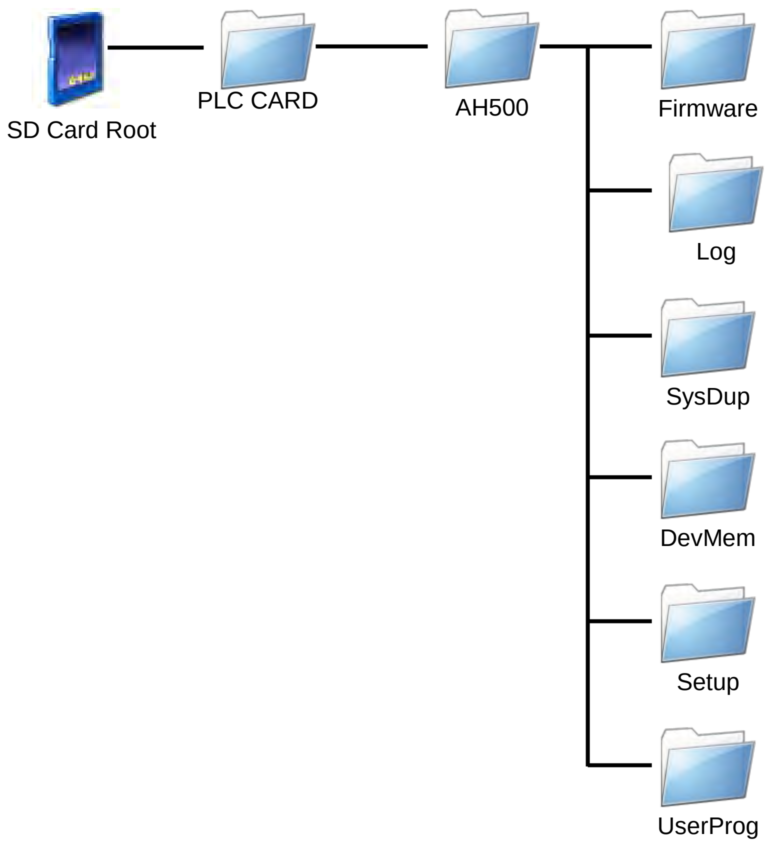
7.4 Contents of a Memory Card

7.4.1 Initializing a Memory Card

Whenever an SD card is inserted into a CPU module which is supplied with power, or power is supplied to a CPU module into which an SD card has been inserted, the system initializes the SD card, and a default folder created in the SD card is named according to the model of the CPU module.
During the initialization of a SD card, if a folder is missing from the default folder group, the system automatically adds the lost folder. However, if the initialization of a SD card fails, the SD card can not be initialized again until it is formatted again.
When a memory card is initialized, the SYSTEM LED indicator blinks.

7.4.2 Folder Structure in a Memory Card

The default folder group created by an AH system is shown below. The folder name is AH500. Several subfolders are contained inside the AH500 folder. Related files created by users and the AH system are stored in the subfolders.



Folder	Description
Firmware	Used for storing firmware files (.mot), (.bin)
Log	Used for storing Log files (.log)
SysDup	Used for storing backup files (.dup)
UserProg	Used for storing device memory files (.txt, .dmd, .csv)
DevMem, Setup	Reserved for the system

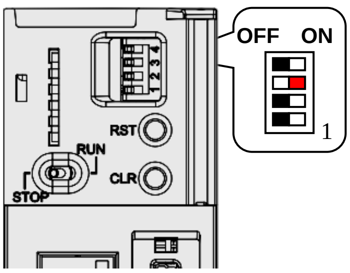
7.5 Reading / Writing a Memory Card

Users can read/write data into/from a memory card to back up and update a system by means of the DIP switch on a CPU module.

7.5.1 Backing up the System

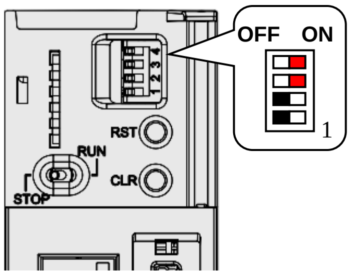
When a system backup is executed, the user program, the parameter setting, the hardware configuration, the network configuration, and the values on the device memories in a CPU module are backed up and saved as a file called AUTOEXEC.dup, which is stored in a folder named SysDup in a memory card. If a default path denotes an existing backup file, the previous data in the old backup file is overwritten when a system is backed up.
A system backup can be executed, whether a CPU module runs or stops. However, users have to make sure that the write protect tab on the left side of a SD card is slid upward before a system backup is executed. The system backup procedure is as follows.

(1) Turn DIP switch 3 ON, and turn the other switches OFF. If users do not want to back up the values on the device memories, they need to turn DIP switch 4 ON.



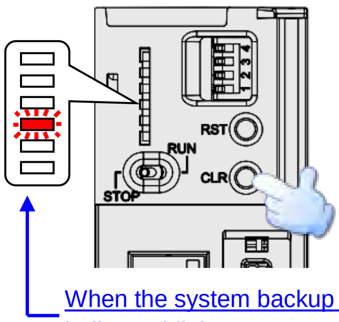
Complete backup

OR



The values in the devices are not backed up.

(2) Press the CLR button on the CPU module for five seconds. When the system backup is executed, the SYSTEM LED indicator blinks. After the system backup is complete, the SYSTEM LED indicator is OFF.

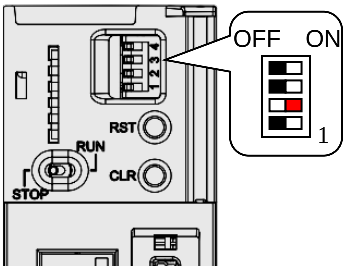


When the system backup is executed, the SYSTEM LED indicator blinks.

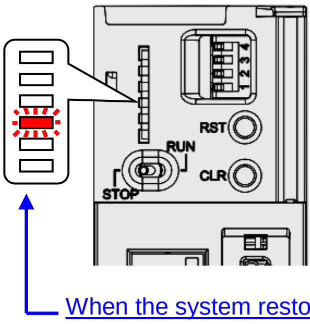
7.5.2 Restoring the System

Before a system restoration is executed, users have to make sure that the backup file AUTOEXEC.dup is stored in a folder named SysDup in a memory card. After the system restoration is executed, the user program, the parameter setting, the hardware configuration, and the network configuration in the memory card are restored to a CPU module. In addition, if the data in the backup file includes the values on the device memories, the data restored to the CPU module will include the values on the device memories.
Before a system restoration is executed, users have to disconnect a CPU module. The system backup procedure is as follows.

(1) Make sure that the CPU module is disconnected, turn DIP switch 2 ON, and turn the other switches OFF.



(2) Restore the power supply. After the system detects that DIP switch 2 is ON, the system restoration is executed. When the system restoration is executed, the SYSTEM LED indicator blinks. After the system restoration is complete, the SYSTEM LED indicator is OFF.



When the system restoration is executed, the SYSTEM LED indicator blinks.

* Whenever power is supplied to a CPU module, the system checks the state of DIP switch 2. If DIP switch 2 is turned ON, a system restoration is executed automatically. As a result, users must turn DIP switch 2 OFF after a system restoration is complete. In addition, the hardware configuration and the backplanes which are involved in a system restoration must be the same as those previously involved in the system backup in order to prevent an error from occurring.

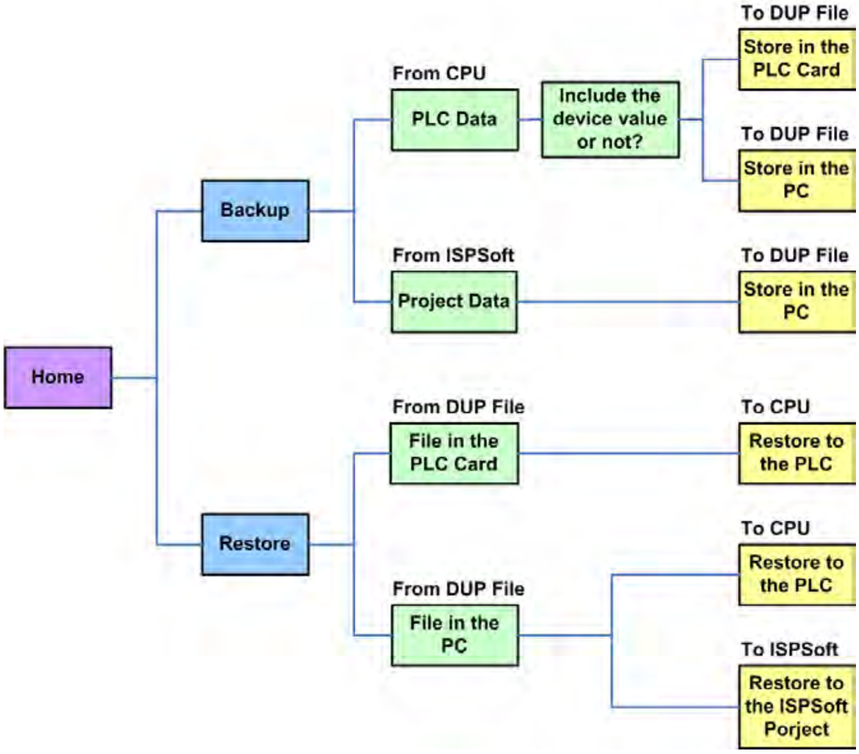
7.6 Introduction of CARD Utility

There are SD slots on AH500 series CPU modules. Users can back up/restore data in an AH500 series CPU module through the use of a memory card. Besides, ISPSoft provides CARD Utility for AH500 series CPU modules. The users can back up/restore data in an AH500 series CPU module or an ISPSoft project through a wizard. The program code, the parameter setting, the hardware configuration, and the network configuration in an AH500 series CPU module or an ISPSoft project can be backed up. The values in the devices in an AH500 series CPU module can also be backed up. Please refer to operation manuals or technical documents for more information about the specifications of the SD cards which can be inserted into AH500 series CPU modules, and the usage of the SD cards.

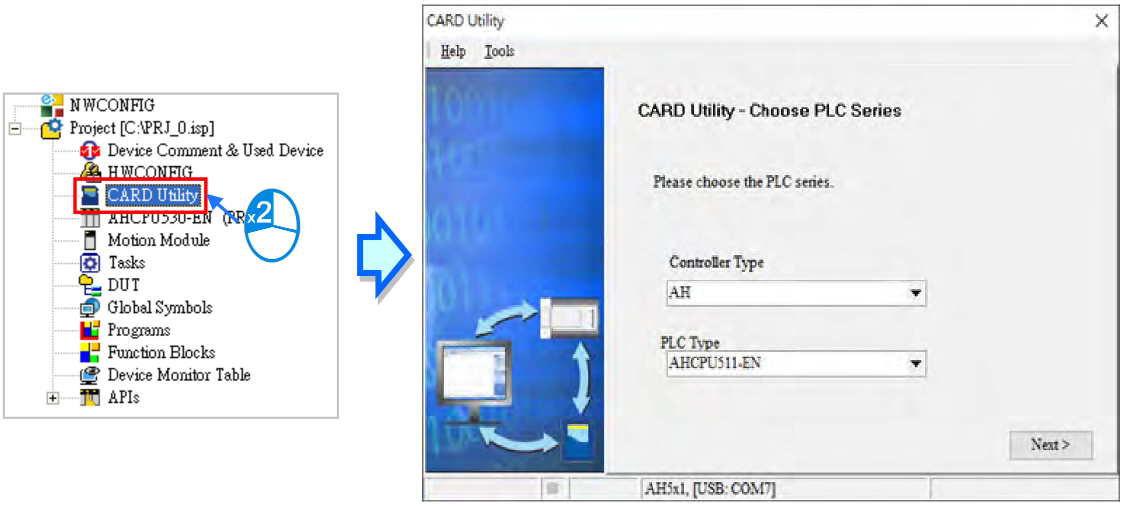
The hardware configuration stored in an AH500 series CPU module is data which is only related to the AH500 series CPU module itself. If users want to back up a hardware configuration, only the part of the network configuration which is related to the AH500 series CPU module selected will be backed up. The part of the network configuration backed up consists of a routing table and an Ether Link. Likewise, if the users want to restore data backed up to an ISPSoft project, there will be no network configuration in the ISPSoft project. Please refer to chapter 9 for more information about a network configuration.

The functions supported by CARD Utility are described below. The diagram below is a flowchart.

- If users export data in an AH500 series CPU module as a backup file (*.dup), the data exported can be saved in the memory card inserted in the AH500 series CPU module, or a folder in the computer. The users can decide whether to back up the values in the devices in the AH500 series CPU module.
- If users export an ISPSoft project for an AH500 series CPU module as a backup file (*.dup), the ISPSoft project exported can only be saved in a folder in the computer, and the values in the devices in the AH500 series CPU module are not backed up.
- Users can put the backup file saved in the memory card inserted in an AH500 series CPU module into the AH500 series CPU module.
- Users can put a backup file (*.dup) saved in a computer into the AH500 series CPU module connected to the computer, or restore the backup file to an ISPSoft project. If the users choose to restore the backup file to an ISPSoft project, the system will automatically skip the values in the devices and the hardware configuration in the backup file.



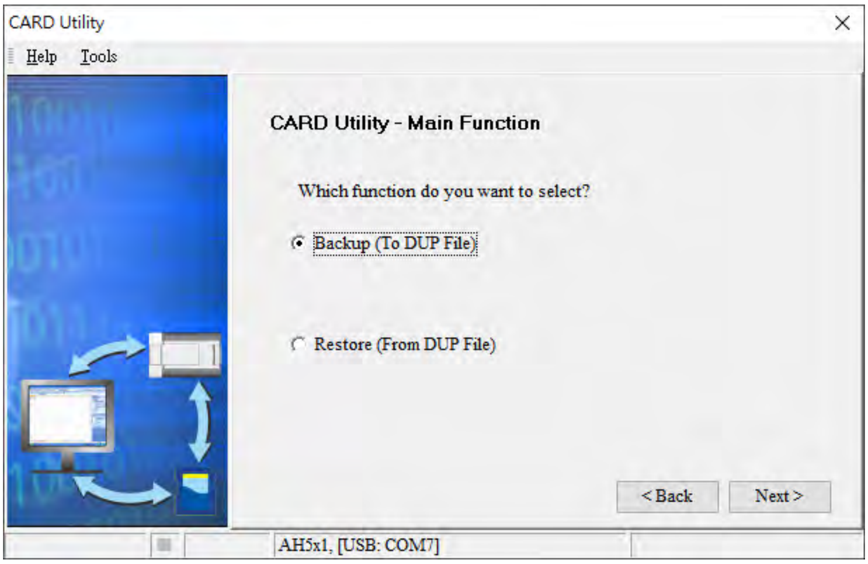
After users double-click **CARD Utility** in the project management area, the system will open the **CARD Utility** window. Select the Controller and PLC Type and click **Next** to go to the setting page.



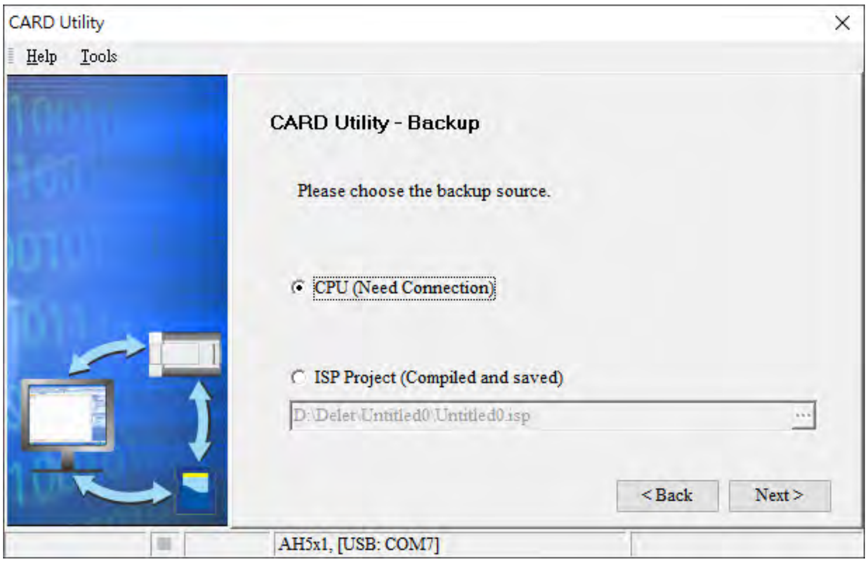
7.7 Backup

If the backup source/backup destination is an AH500 series CPU module or the memory card inserted in an AH500 series CPU module, users have to make sure that ISPSoft is connected to the AH500 series CPU module normally. Please refer to section 2.4 in ISPSoft User Manual for more information.

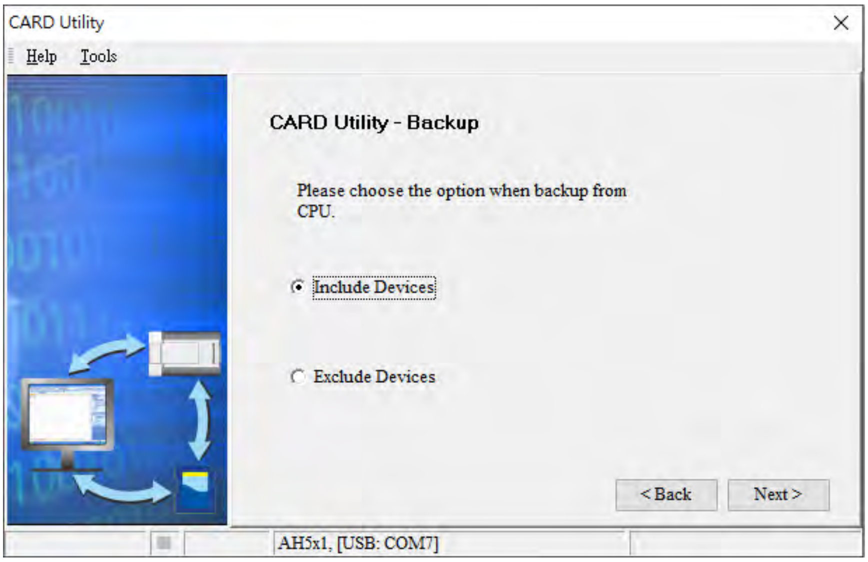
(1) Select the **Backup (To DUP File)** option button in the **CARD Utility** window, and then click **Next**.



(2) Select a backup source, and then click **Next**.
After the users select the **ISP Project (Compiled and saved)** option button, they have to click ..., and select an isp file in the **Open** window. If the program in the isp file selected is not compiled, a message appears when the isp file is backed up. Open the isp file with ISPSoft, compile the program in the isp file, and save the isp file. After the program in the isp file is compiled, the users can back up the isp file.



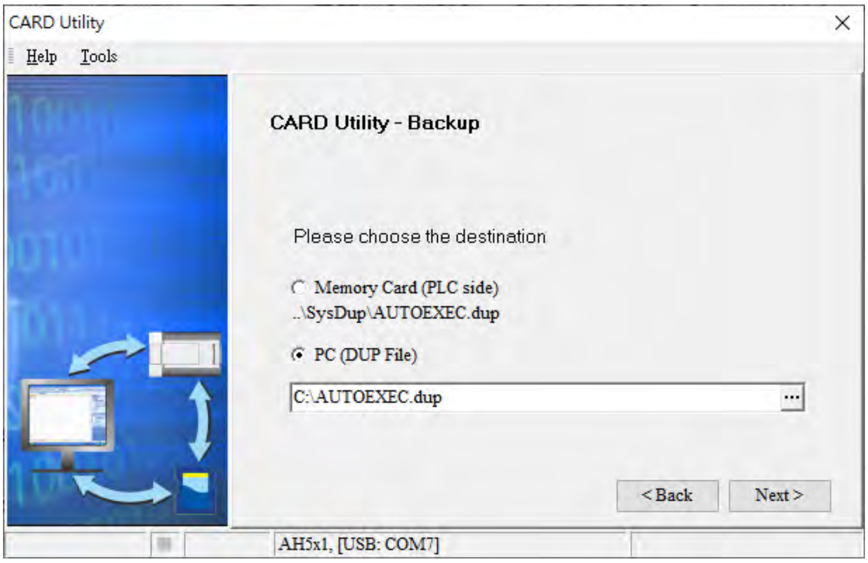
(3) After the users select the **CPU (Need Connection)** option button, they have to decide whether to back up the values in the devices in the AH500 series CPU module which is connected to ISPSoft.



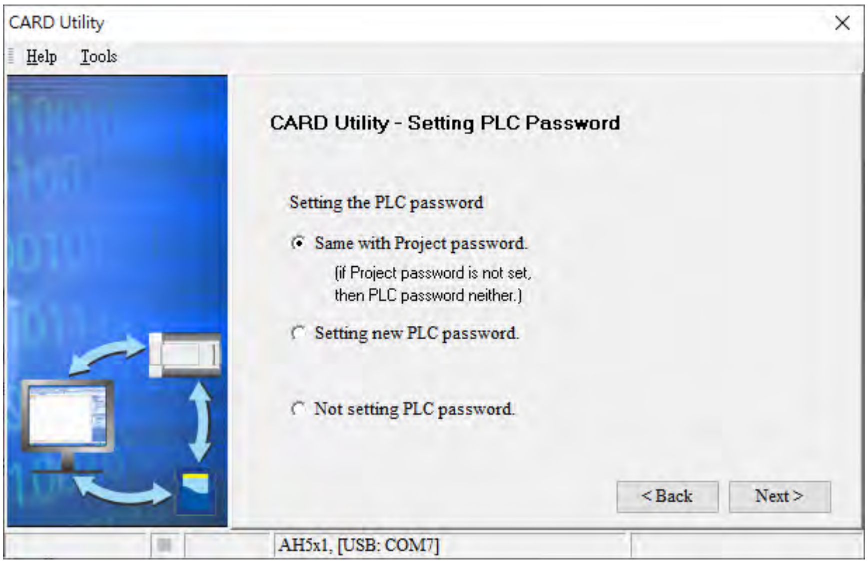
(4) Select a backup destination. To backup an ISPSoft project, the backup destination must be a computer.

a. If the **Memory Card (PLC Side)** option button is selected, the filename of the backup file which will be produced will be **AUTOEXEC.dup**, and the path which points to the backup file will be **Root directory of the memory card\AH500\SysDup\AUTOEXEC.dup**.

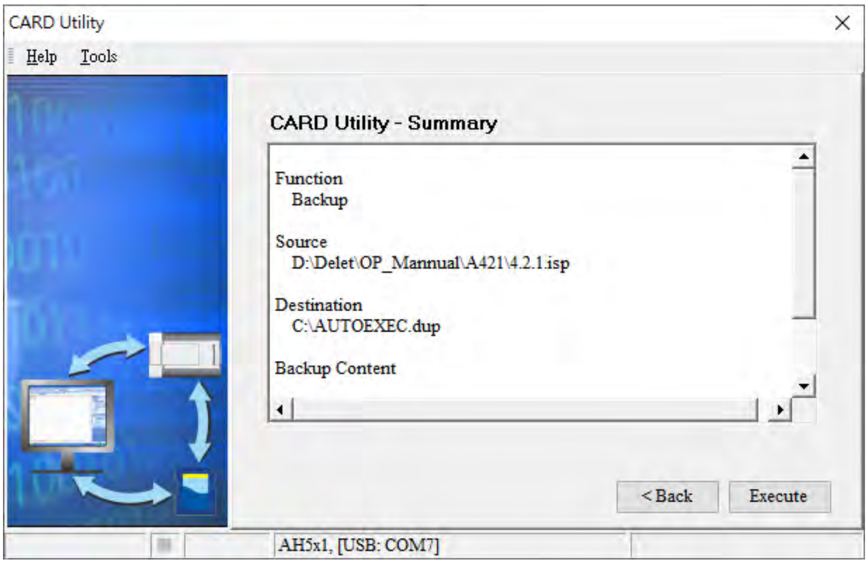
b. If the **PC (DUP File)** option button is selected, the users have to click **...**, select a folder in the **Save in** drop-down list box in the **Save As** window, and type a filename in the **File name** box.



(5) Users can setup a PLC password when backing up an ISPSoft project. You can use the Project password for the PLC password or create a new password for PLC password. When selecting to create a new PLC password, a setting window appears for you to set the password and how many password attempts you can try.



(6) After the users make sure that the summary in the **CARD Utility** window is consistent with the data backup which will be performed, they can click **Execute**.

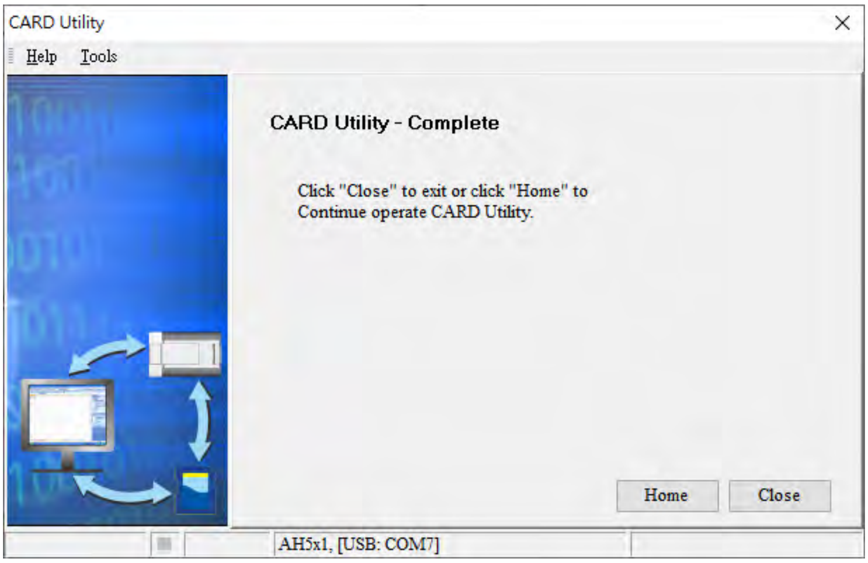


Even if the users click **Cancel** to stop ISPSoft from performing the data backup in the process of backing up data in the AH500 series CPU module onto the memory card inserted in the AH500 series CPU module, the AH500 series CPU module will still performs the data backup. The users can turn off the AH500 series CPU module to stop the data backup from being performed. However, the backup file produced is not a complete backup file. As a result, the users have to delete the backup file from the memory card.

If the data backed up is protected by passwords, these passwords will also be backed up.

Data backup	Description
CPU module→Memory card	The data backed up includes the PLC ID and the PLC password set in the CPU module.
CPU module→Computer	The system asks users to type a PLC ID and a PLC password. If the PLC ID and the PLC password typed are correct, the data backup will be performed. The data backed up includes the PLC ID and the PLC password.
ISPSoft project→Computer	The data backed up includes the program ID, the project password set in the ISPSoft project and the PLC password if there is any.

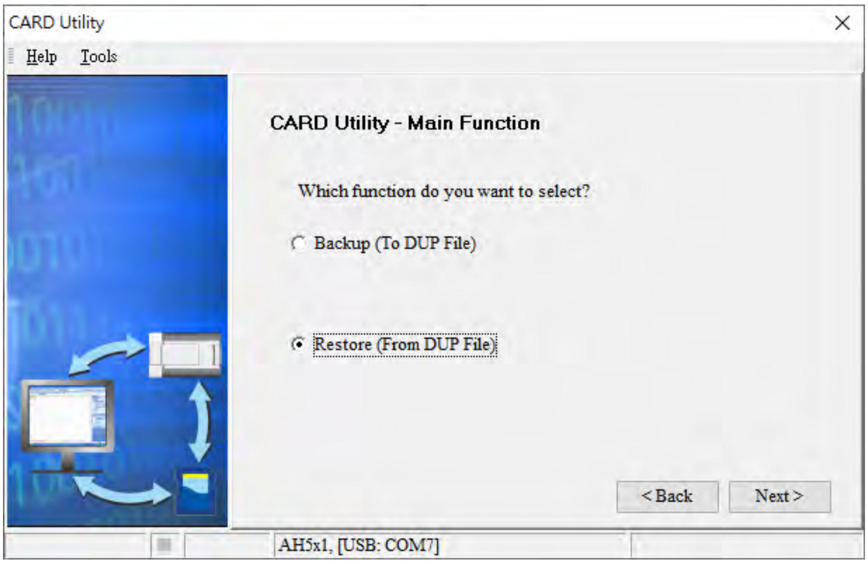
(7) After the data backup is performed, the users can click **Home** or **Close** in the **CARD Utility** window.



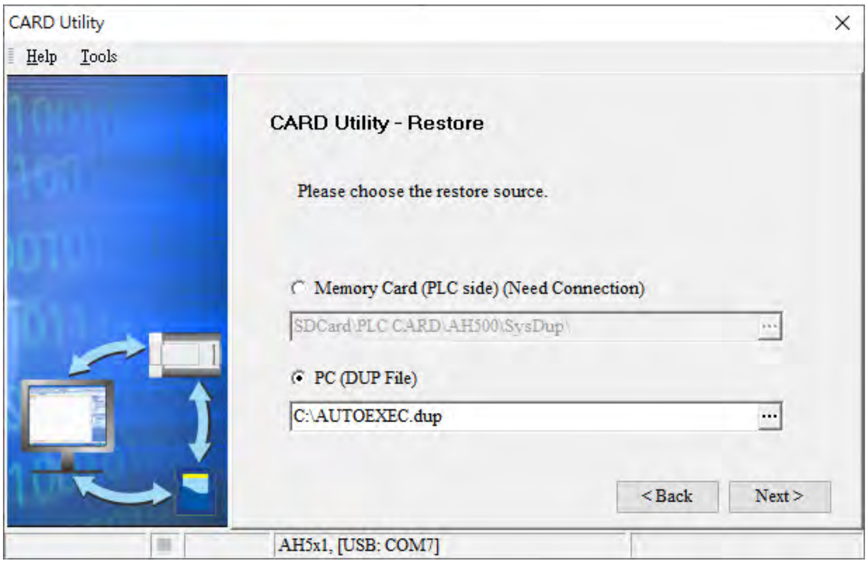
7.8 Restoration

If the restoration source/restoration destination is an AH500 series CPU module or the memory card inserted in an AH500 series CPU module, users have to make sure that ISPSoft is connected to the AH500 series CPU module normally. Please refer to section 2.4 in ISPSoft User Manual for more information.

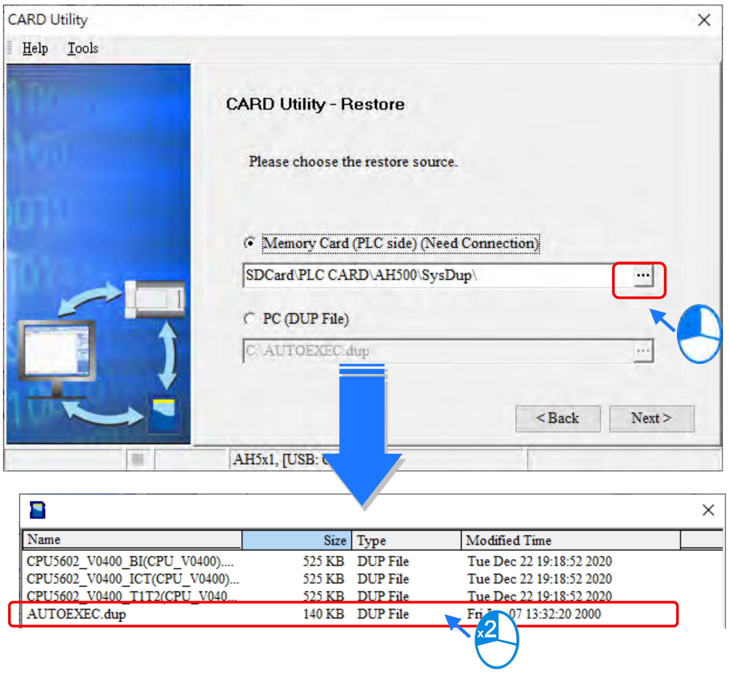
(1) Select the **Restore (From DUP File)** option button in the **CARD Utility** window, and then click **Next**.



(2) Select a restoration source, click ···, and select a backup file.



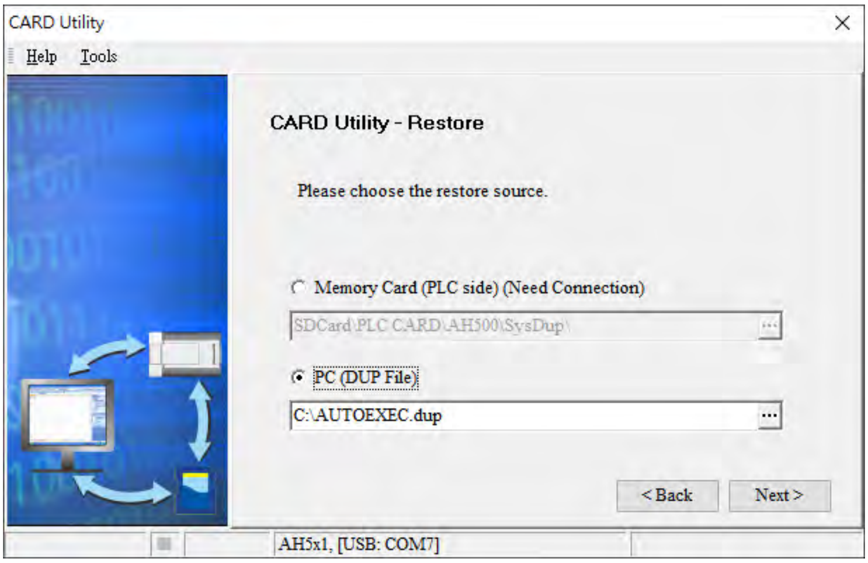
If the **Memory Card (PLC side) (Need Connection)** option button is selected, the backup files in the memory card inserted in the AH500 series connected to ISPSoft will be displayed in a window after ··· is clicked. The users have to double-click a backup file in the window.



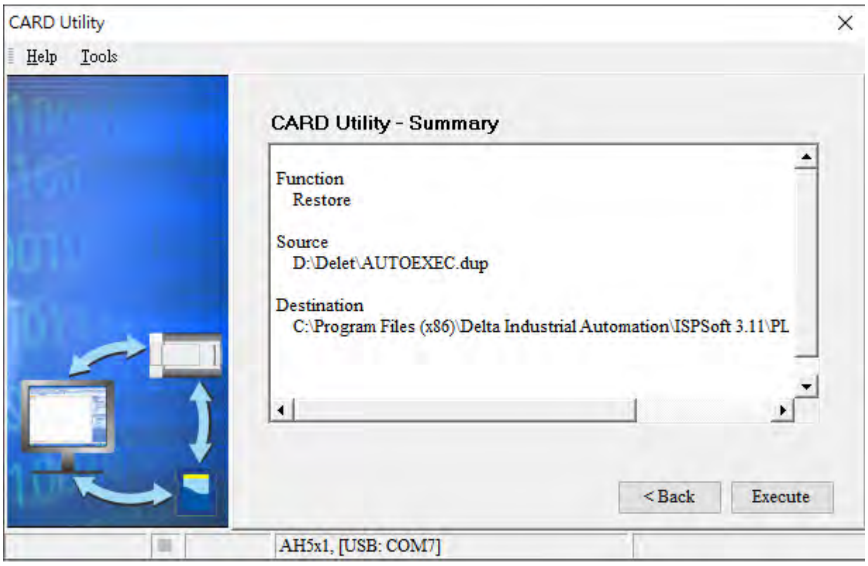
(3) Select a restoration destination, and then click **Next**.

a. If the users want to put the backup file selected into the AH500 series CPU module which is connected to ISPSoft, they have to select the **CPU (Need Connection)** option button. If the restoration source is the memory card inserted in the AH500 series CPU module connected to ISPSoft, the restoration destination must be the AH500 series CPU module.

b. If the **ISP Project** option button is selected, the users have to click ···. After the users click ···, they have to specify a filename and a path. If the path specified point to a file which exists in the computer, the file will be overwritten after the data restoration is performed.



(4) After the users make sure that the summary in the **CARD Utility** window is consistent with the data restoration which will be performed, they can click **Execute**.



If the users click **Cancel** in the process of restoring data to the AH500 series CPU module, the data will not be completely restored. To prevent the AH500 series CPU module from operating incorrectly, the users have to restore the AH500 series CPU module to the factory setting if they do not perform the data restoration again. Besides, the AH500 series CPU module will still performs the data restoration even if the users click **Cancel** in the process of restoring a backup file in the memory card inserted in the AH500 series CPU module. The users can turn off the AH500 series CPU module to stop the data restoration from being performed.

If restoration source/restoration destination contains a password and an ID, the password and the ID will be processed.

Data restoration	Description
Memory card→CPU module	a. The ID in the backup file must be the same as the ID in the CPU module, otherwise the data restoration will not be performed. b. If there is a PLC password in the CPU module, the password in the backup file must be the same as the PLC password in the CPU module. Otherwise the data restoration will not be performed. c. If there is no PLC password in the CPU module, and there is a password in the backup file, the system will perform the data restoration, and the password in the backup file will become the PLC password in the CPU.
Computer→CPU module	a. The ID in the backup file must be the same as the ID in the CPU module, otherwise the data restoration will not be performed. b. If there is a PLC password in the CPU module, the password in the backup file must be the same as the PLC password in the CPU module. Otherwise the data restoration will not be performed, and a message will appear. c. If there is no PLC password in the CPU module, and there is a password in the backup file, the system will perform the data restoration, and the password in the backup file will become the PLC password in the CPU.
Computer→ ISPSoft project	Before restoring, the PLC password is required, if there is a PLC password in the backup file. After restoring is done, the Project password, and the program ID will be restored in the ISPSoft Project. As for the PLC password and the PLC ID, they cannot be saved in the ISPSoft project.

(5) After the data restoration is performed, the users can click **Home** or **Close** in the **CARD Utility** window.

MEMO

Chapter 8 Hardware Configuration

Table of Contents

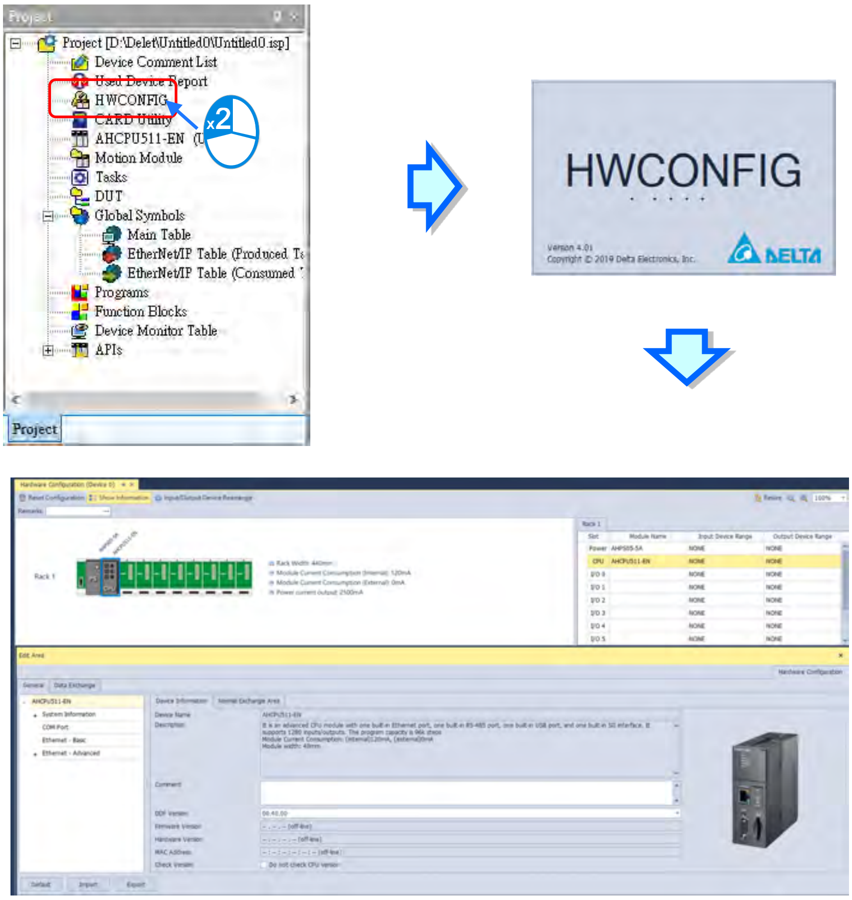
8.1 Hardware Configuration Tool for AH500 Series Modules - HWCONFIG

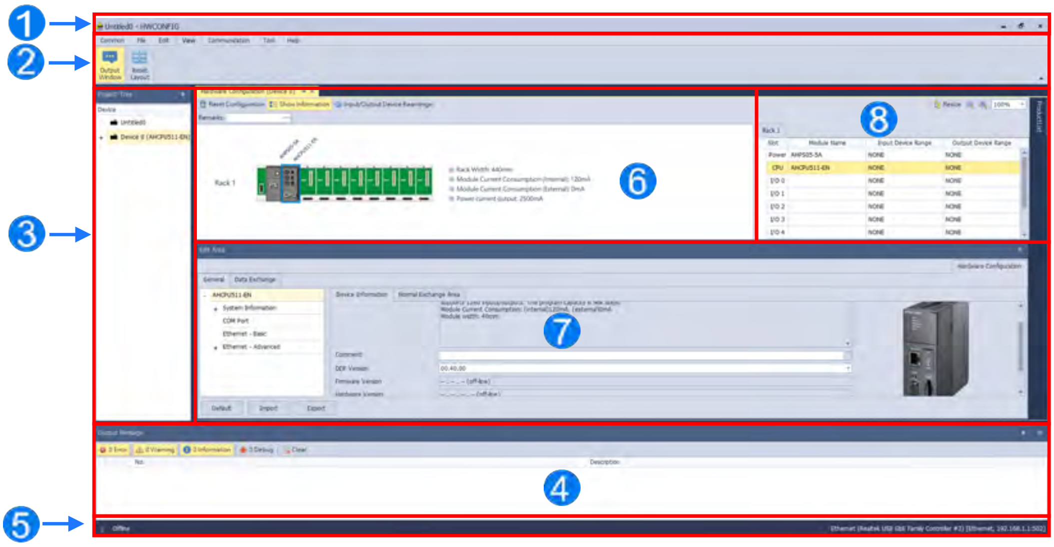
HWCONFIG is a built-in hardware configuration tool in ISPSoft. You can configure CPU and module parameters, download/upload parameters, detect a hardware configuration online, and make a diagnosis through HWCONFIG. The examples used below are from HWCONFIG 4.0 (ISPSoft V3.12). Refer to previous versions of ISPSoft Manual for the operation examples on the previous versions of HWCONFIG.

You must download all parameters set in HWCONFIG to the CPU module for them to take effect.
The data exchange area set in HWCONFIG for modules can NOT be used repeatedly for other communication data and vise versa.

8.1.1 Introduction of the Environment of HWCONFIG

In ISPSoft, double-click **HWCONFIG** in the project management area to start **HWCONFIG**.





❶ **Window Title:** Here shows the current project name and the program name.

❷ **Tool Bar:** There are 6 tabs on the tool bar.

❸ **Project Tree:** Tree-structured projects for easier management

❹ **Output Message Section:** Here shows project related information.

❺ **Status Bar:** Here shows the connection status and the communication parameters.

❻ **Hardware Configuration Area:** You can set up hardware configuration here.

❼ **Edit Area:** You can set up parameters for PLC CPU and modules.

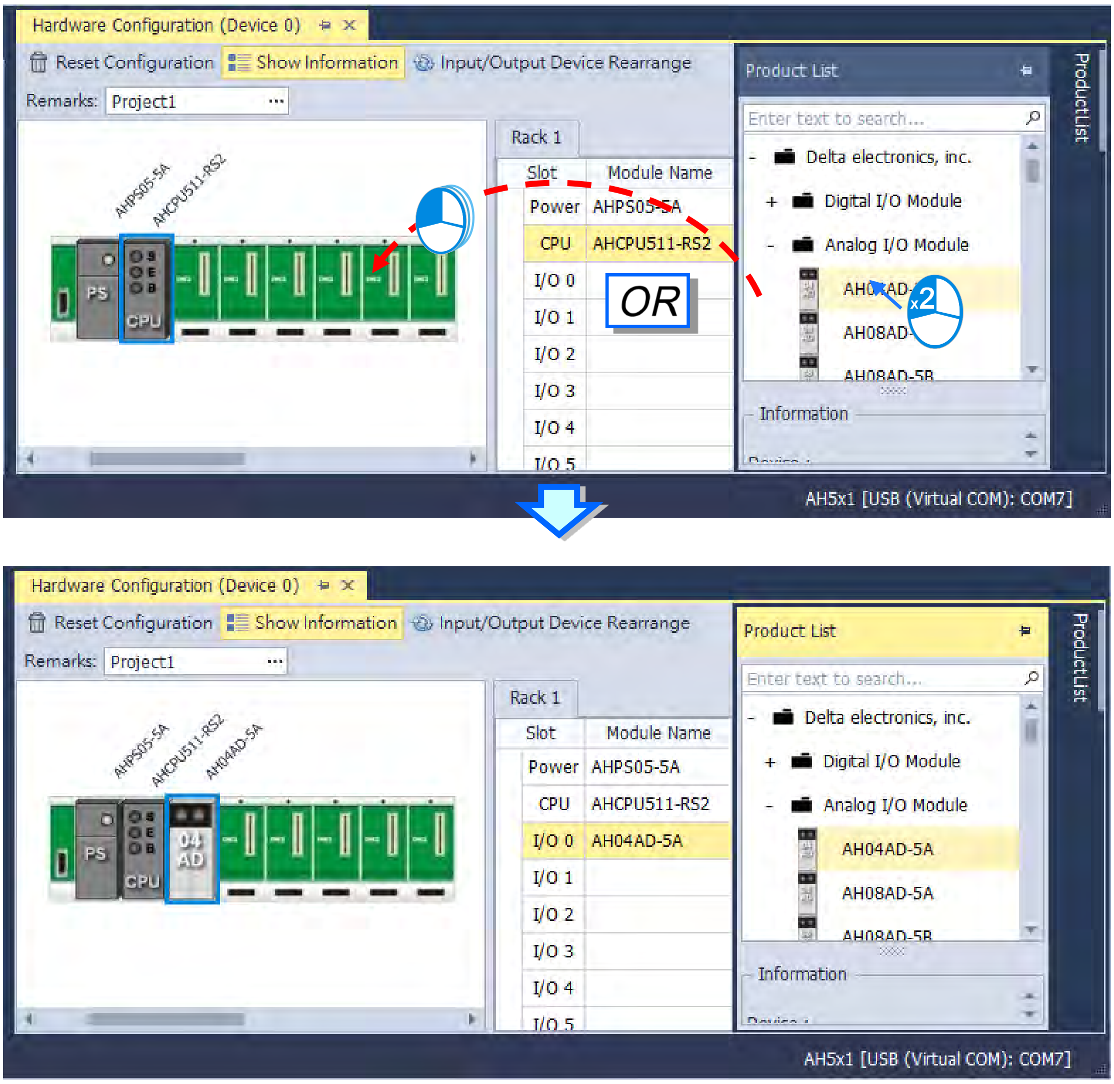
❽ **Rack Information:** Here shows the connected modules on the rack.

8.1.2 Configuring a Module

8.1.2.1 Adding a Module

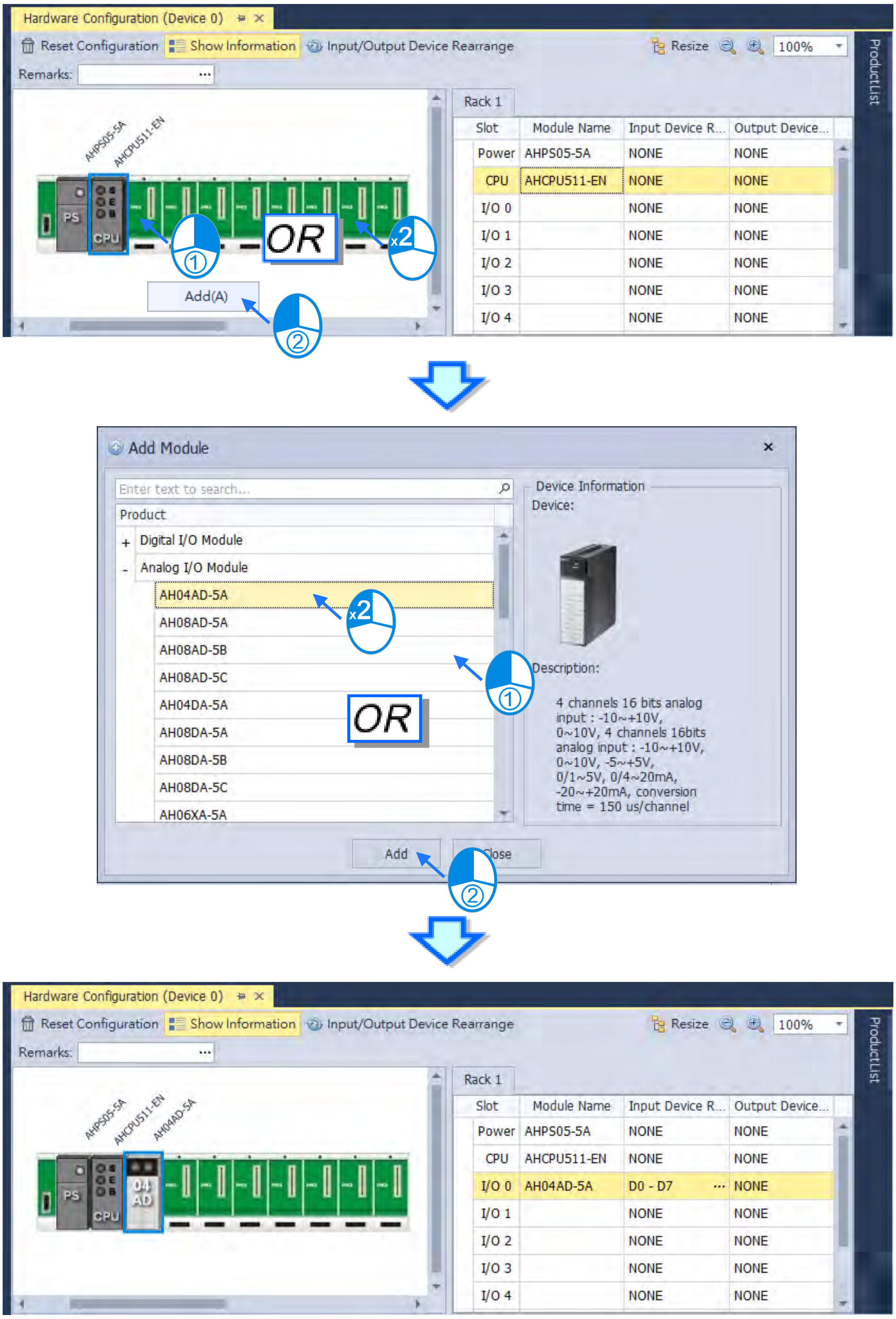
- **Method 1**

Double-click the module you want to add in the project or select it from the **Product List** and drag that module to the desired position. There will be a suggestive dotted line to indicate the legitimate position for the selected module.



- **Method 2**

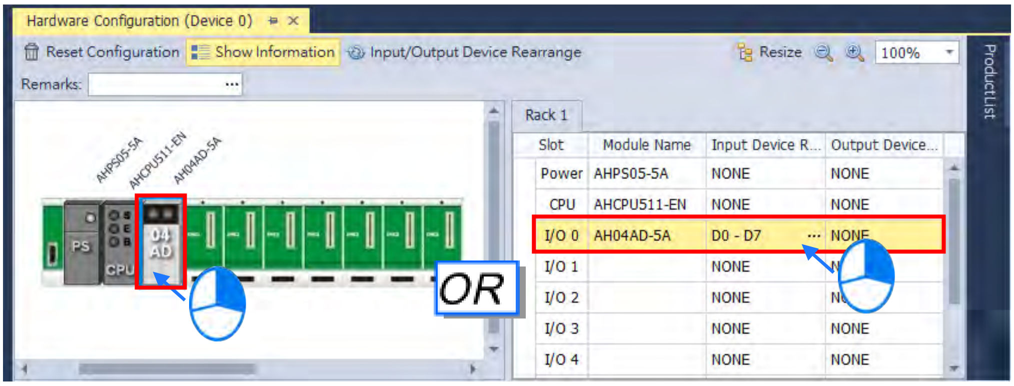
(1) Double-click a vacant slot or right-click the slot and choose **Add**. And double-click the selected module to add. You can repeat these two steps to add more modules in.



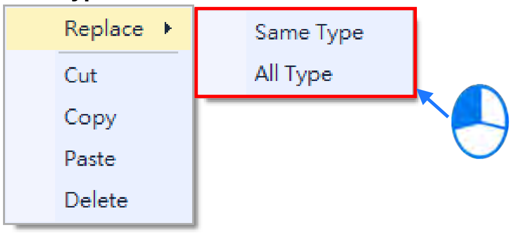
8.1.2.2 Replacing the Module

The following steps show you how to replace the module.

(1) Select and right-click the module for replacement in **Hardware Configuration** area or from **CPU Group Information** section.



(2) Choose **Replace** on the context menu. After that you can see two different types of replacements for selection, **Same Type** and **All Type**.



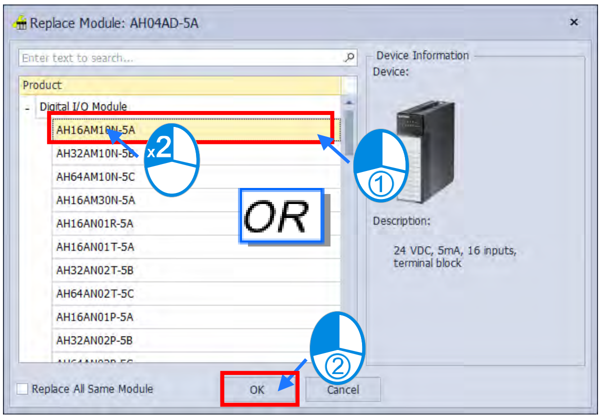
- **Same Type**

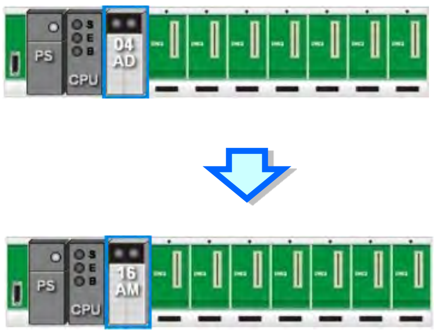
  Replace only the selected module with the same type module. The new module **Input/Output Device Range** will be the same, while other parameters may return to system defaults if they cannot be matched.

- **All**

  Replace selected module to be any type of module. The result is similar to deleting the original module by adding a new one, so the new module **Input/Output Device Range** will be re-configured and other parameter settings will also return to system defaults.

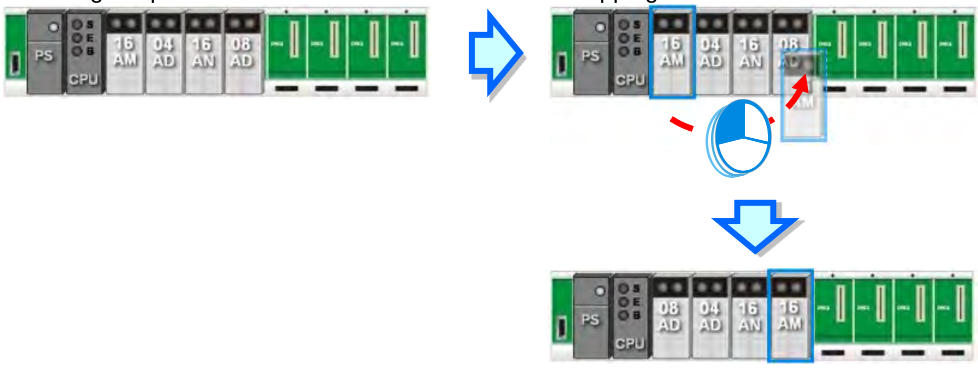
(3) Once the replace type is selected, the Module Selection window appears with modules available for the selected replace type. Double click or select the module you want to replace with and click **OK**.





8.1.2.3 Rearrange Module Position by Drag and Drop

Except CPU modules, you can drag and drop all module graphics in Hardware Configuration area to rearrange their positions. When the module is dragged to a other backplane, a red arrow mark appears indicating the position where the module will be after dropping.

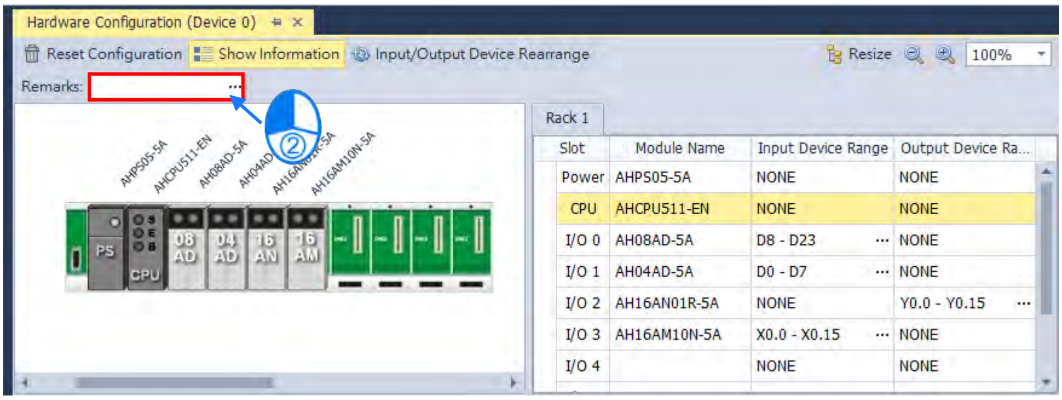


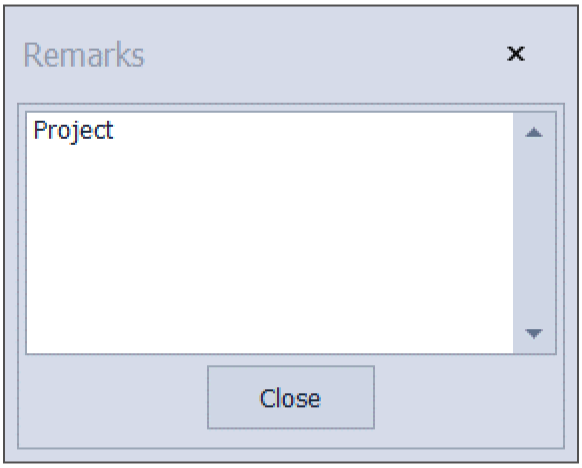
* When rearranging the module position, the input/output device range, comment, internal parameters, corresponding device D and advanced parameters for intelligent modules are also rearranged with the module.

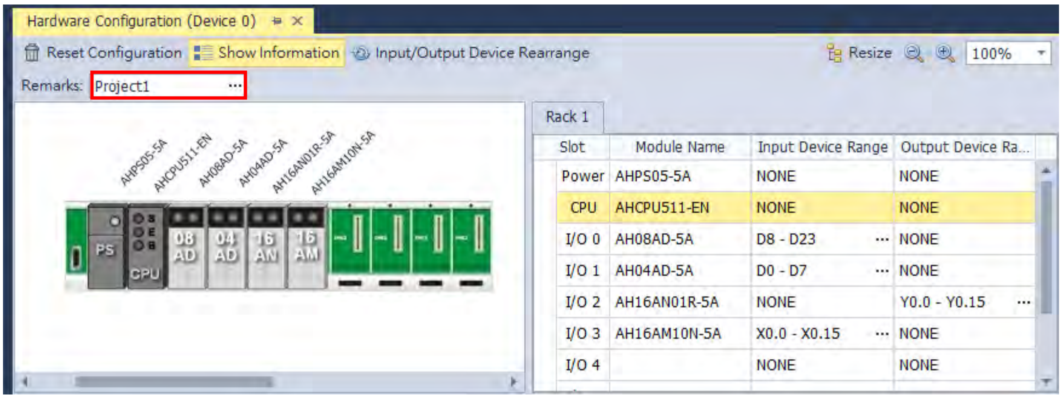
8.1.2.4 Remarks and Comments

- **Remarks for the project**

Click Remarks field on the top of the Hardware Configuration area and a blank box appears for you to leave remarks for the project. After typing the remarks, press Enter on the keyboard or click Close to save the remarks.

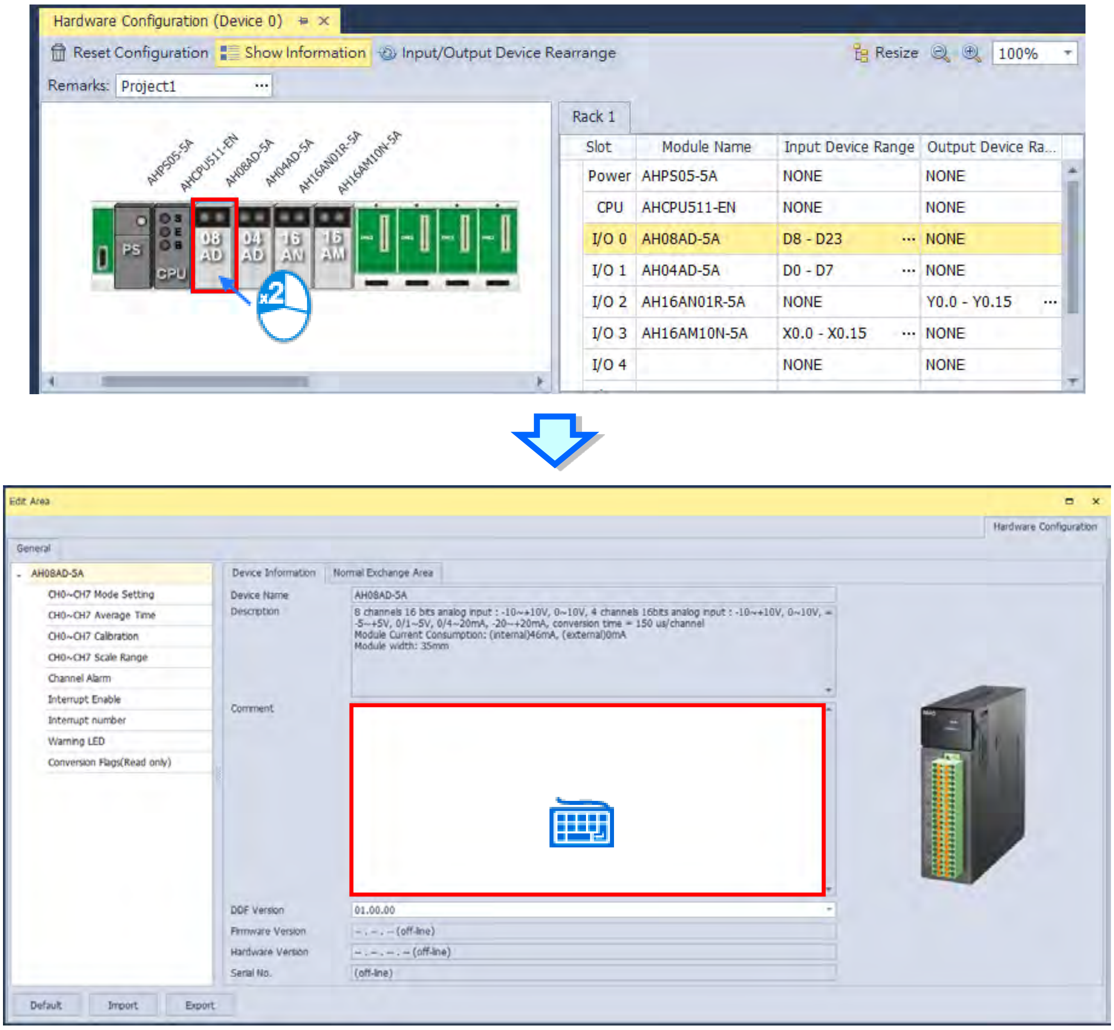






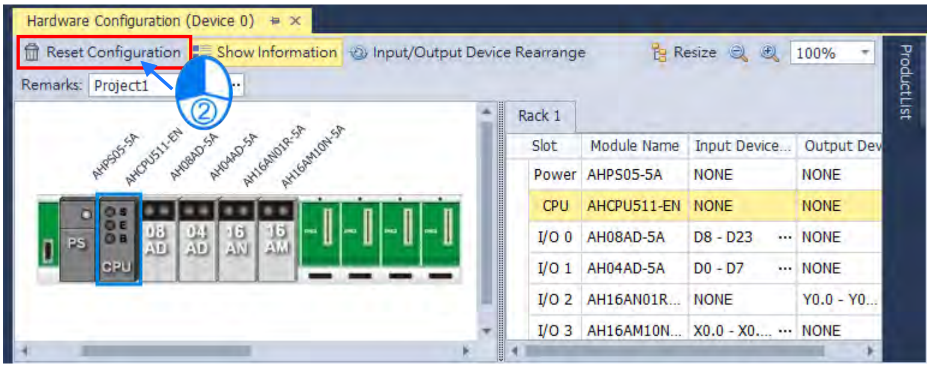
- **Comments for PLC CPU and Modules**

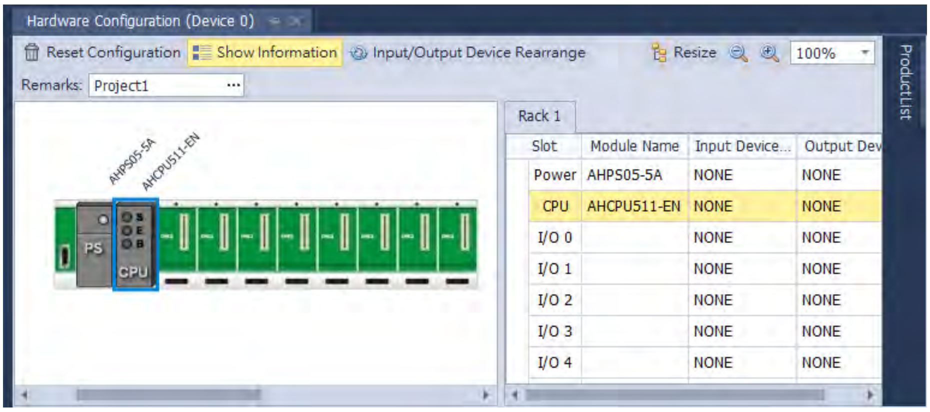
Click the module graphic and you can see its details in the Edit Area. You can leave comments for the PLC CPU and Modules. After typing the comments, it saves the comments automatically.



8.1.2.5 Hardware Configuration Area – Reset Configuration

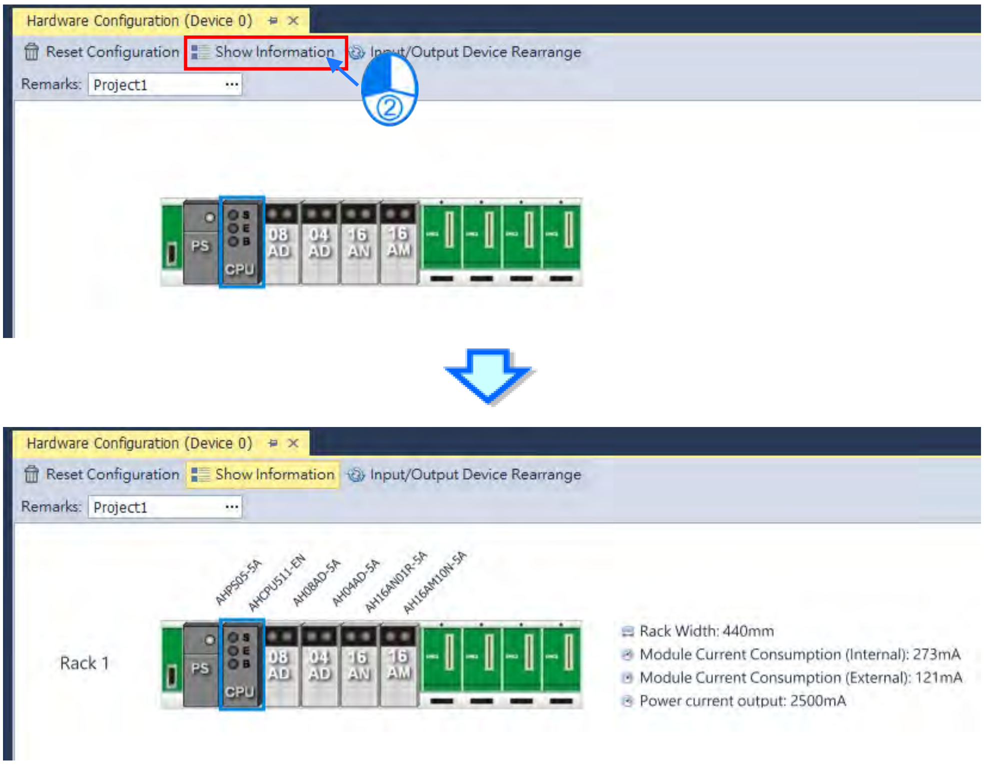
Use the functional button **Reset Configuration** to set the PLC configurations back to default values





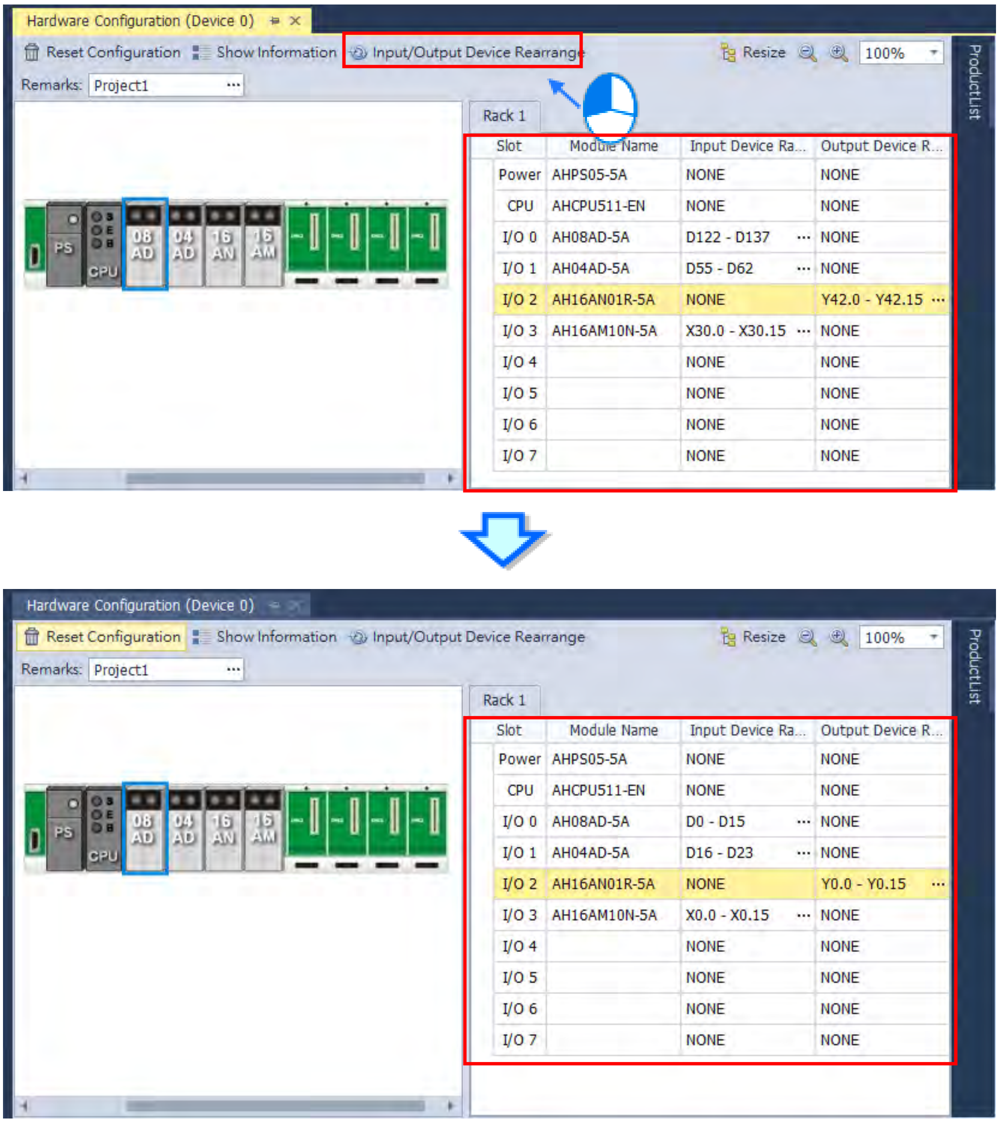
8.1.2.6 Hardware Configuration Area – Show Information

Use the functional button **Show Information** to show / hide the hardware configurations.

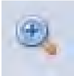
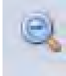
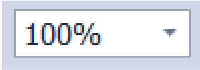


8.1.2.7 Hardware Configuration Area – Input / Output Device Rearrange

Use the functional button **Input / Output Device Rearrange** to rearrange the device ranges and assign the devices to the very beginning of the range.

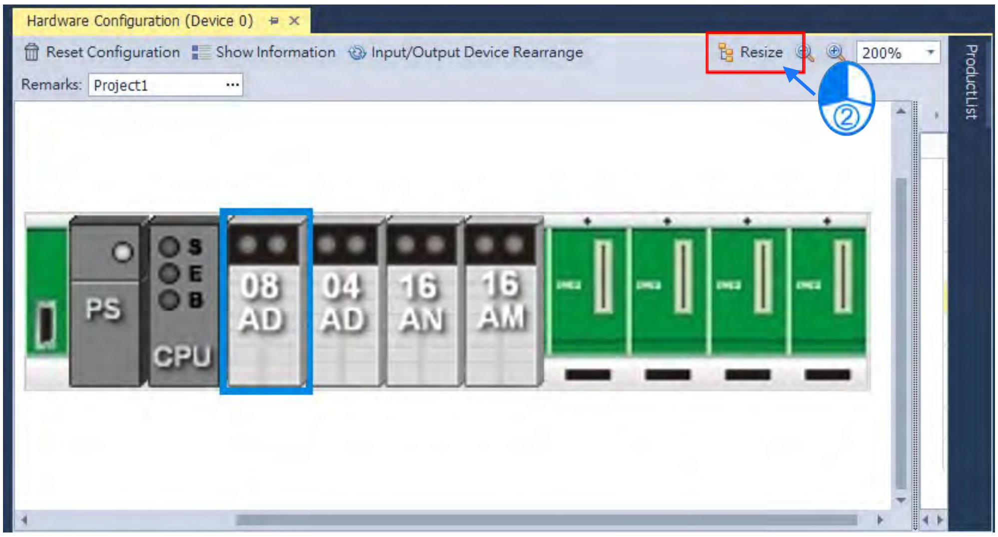


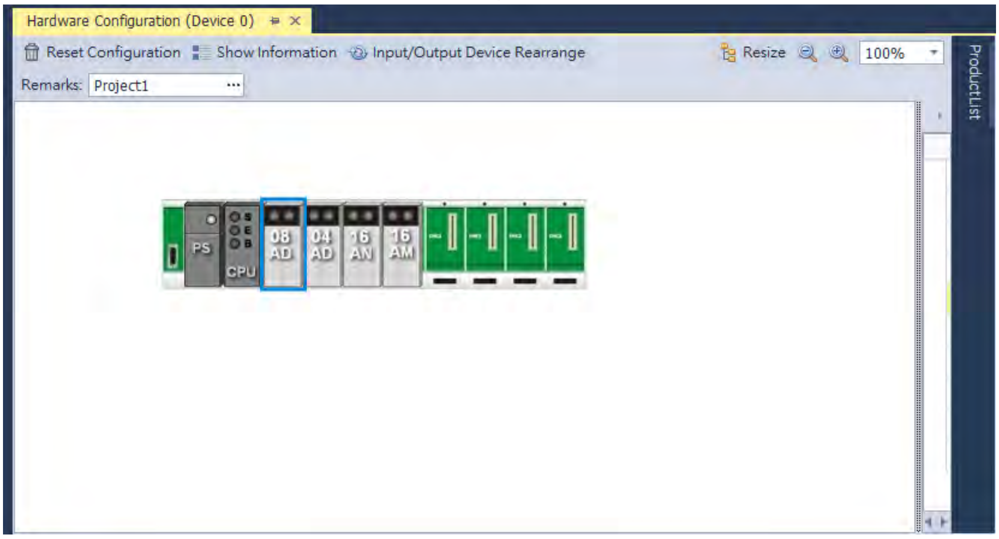
8.1.2.8 Hardware Configuration Area – Resize

Use the functional buttons ,  or 

to rearrange the size of the device images in Hardware Configuration Area. Use 

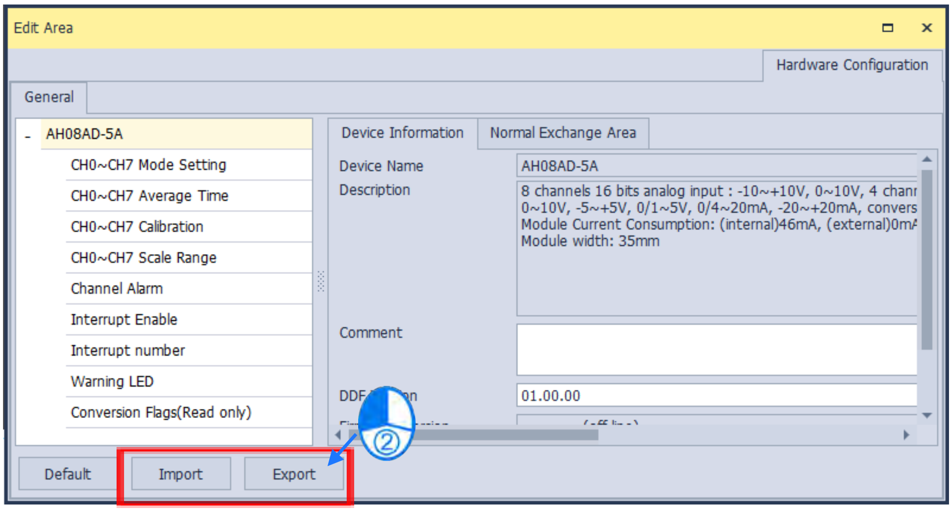
to set the display of the configuration area back to its default values (shown at 100% and in the center).





8.1.2.9 Edit Area – Import and Export

You can import/export the module parameters in .dep format. Click the **Import** button and then choose a file to import. Click the **Export** button and then choose a path and enter a file name for the exported file. Click the **Import** button to import. When importing, the system checks if the file format and the module name are matched. If not, an error message shows up. If the addresses of the imported data device are already taken, the addresses will be assigned to other available addresses.

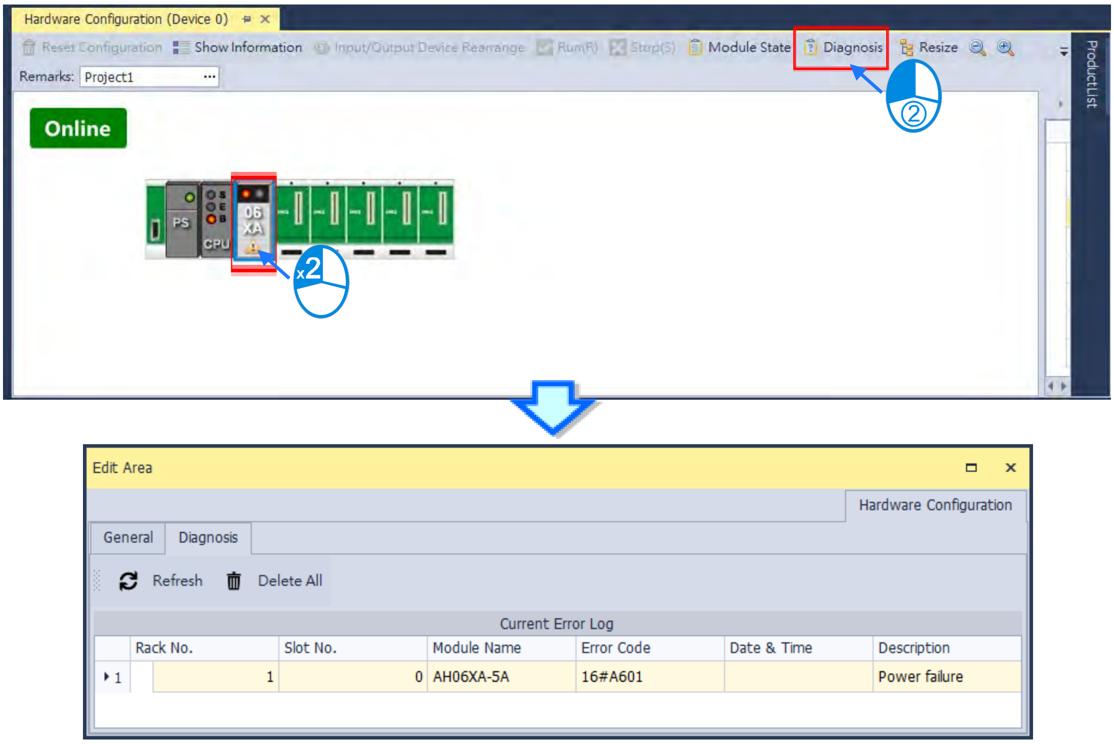


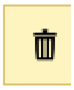
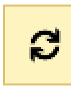
8.1.2.10 Show or Hide the Display

Click or to hide the display area and after that only its tab remains shown. Move your cursor to the tab to have the hidden display area shown. Click to pin and lock the display area to keep it shown.

8.1.2.11 Module State and Diagnosis

To check the module state and diagnosis, first you need to be in the online mode. Right-click the module that you want to check its module state and diagnosis and then a context menu appears.



After you click Diagnosis, you can see a table with three tabs. On the Diagnosis tab, you can see the Current Error Log table. When the error is cleared, you can use  to clear the error log stored in the module and the module state can be restored to normal. Use  to update the module state.

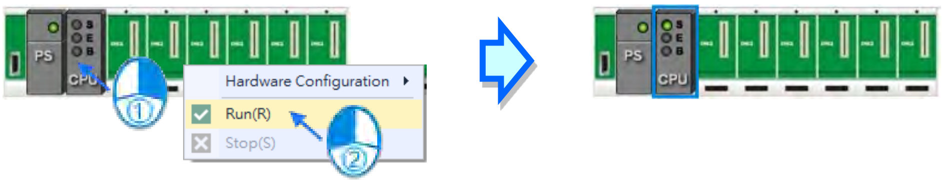
8.1.2.12 Change Module State in Online Mode

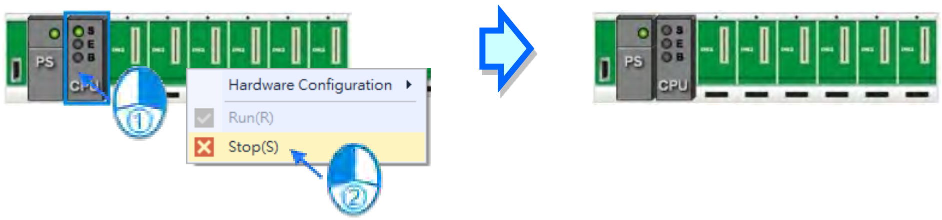
You can change the module state in online mode.

⚠ Before changing the module state, make sure no personnel or system will be affected.

- **Change the module operation state**

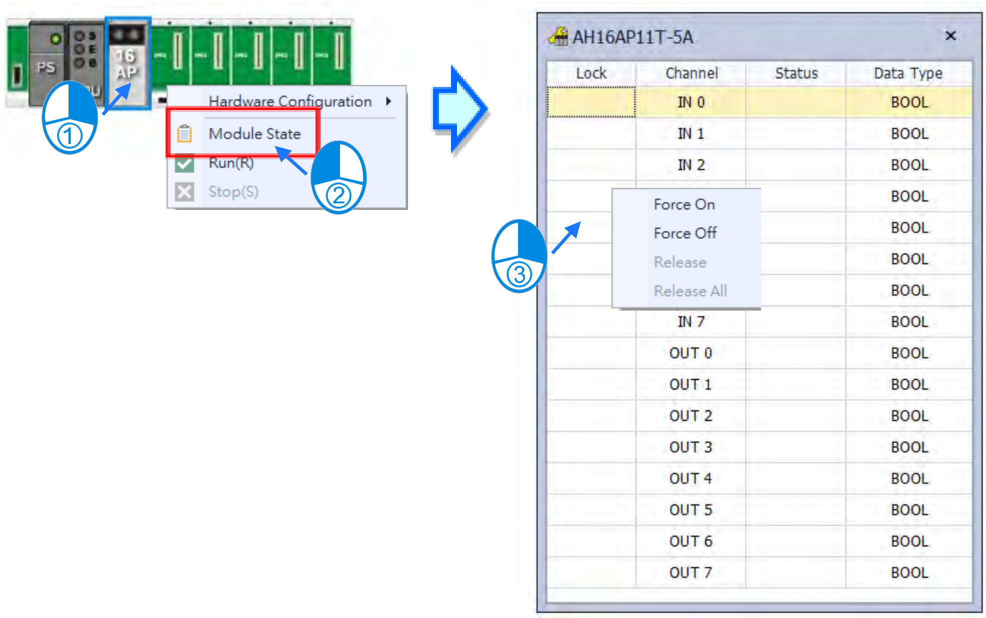
Right-click the PLC CPU to see the context menu and click **Run** for the PLC CPU and module to start running (RUN LED ON) or click **Stop** for the PLC CPU and module to stop running.





- **Change the module I/O state**

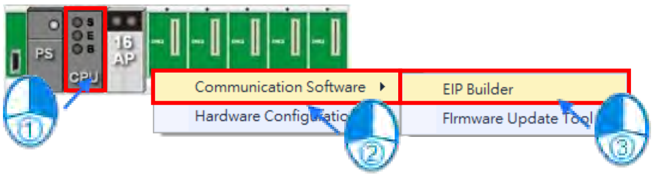
This functionality is only available for digital IO modules, analog IO modules and temperature modules. Right-click the module to see the context menu and click **Module State** and then you can see an IO state table shows up. For digital IO modules, you can right-click to set the input/output channel to ON or OFF, when the PLC CPU and the module are on the RUN state.



- **Force to ON：Force to set the channel state to ON**
- **Force to OFF：Force to set the channel state to OFF**
- **Release：Release the selected channel from the force**
- **Release all：Release all channels from the force**

8.1.2.13 Open Communication Software from HWCONFIG

Right-click the PLC CPU and click **Communication Software** to see which software is available for this PLC CPU. If the software option is grayed out, you may need applicable function cards to work along with the project.



8.1.3 Setting the Parameters in an AH500 Series CPU Module

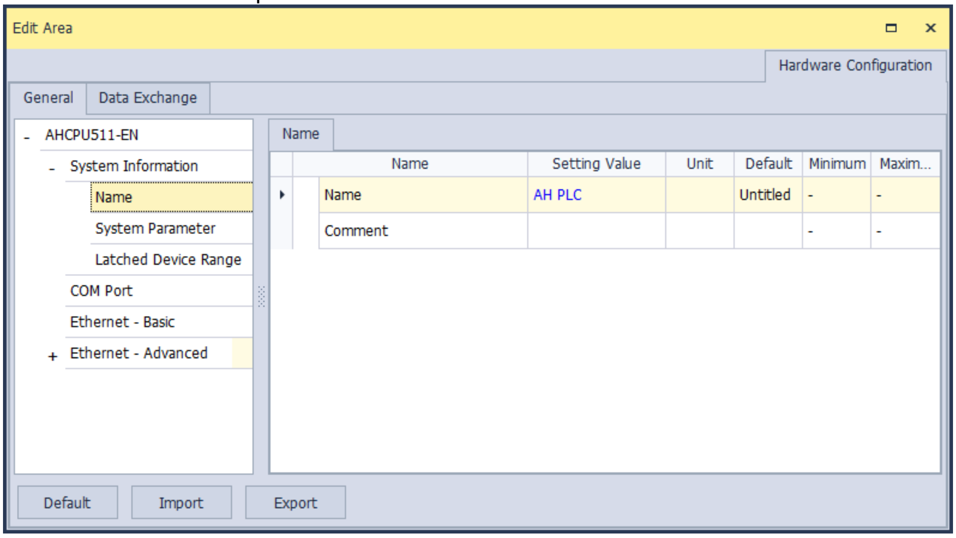
In ISPSoft, double-click **HWCONFIG** in the project management area to start **HWCONFIG**. After users double-click the CPU module in the system configuration area, the **PLC Parameter Setting** window will appear. The parameters which can be set vary with the models of the CPU modules.

<u>You must download all parameters set in HWCONFIG to the CPU module for them to take effect.</u>

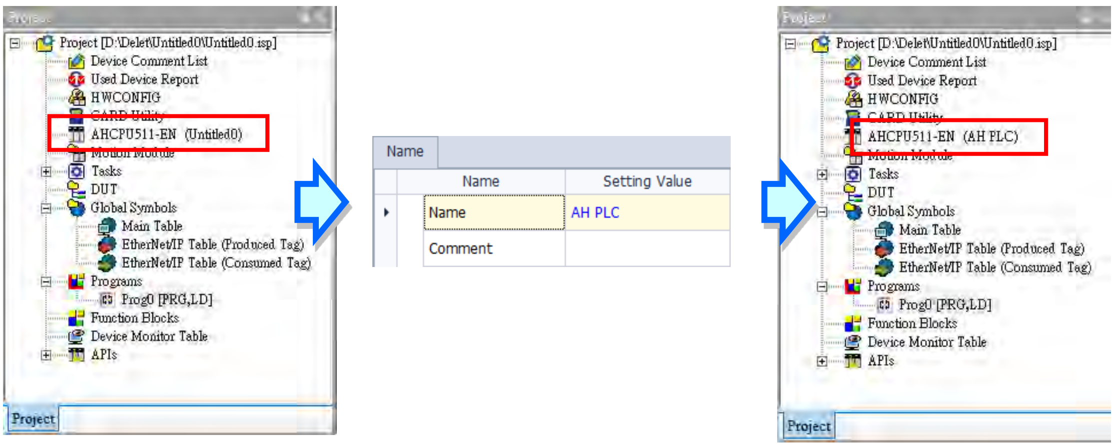
<u>The data exchange area set in HWCONFIG for modules can NOT be used repeatedly for other communication data and vise versa.</u>

8.1.3.1 System Settings – System Information

In the Edit Area, select the option **System Settings** and you can find two items, **PLC Label** and **Comment** under this option. You can input up to 16 characters in the value field of **PLC Label** and 32 characters in the value field of **Comment**. You can use all in the fields, including special characters and spaces. Note: One Chinese character occupies two characters. Characters

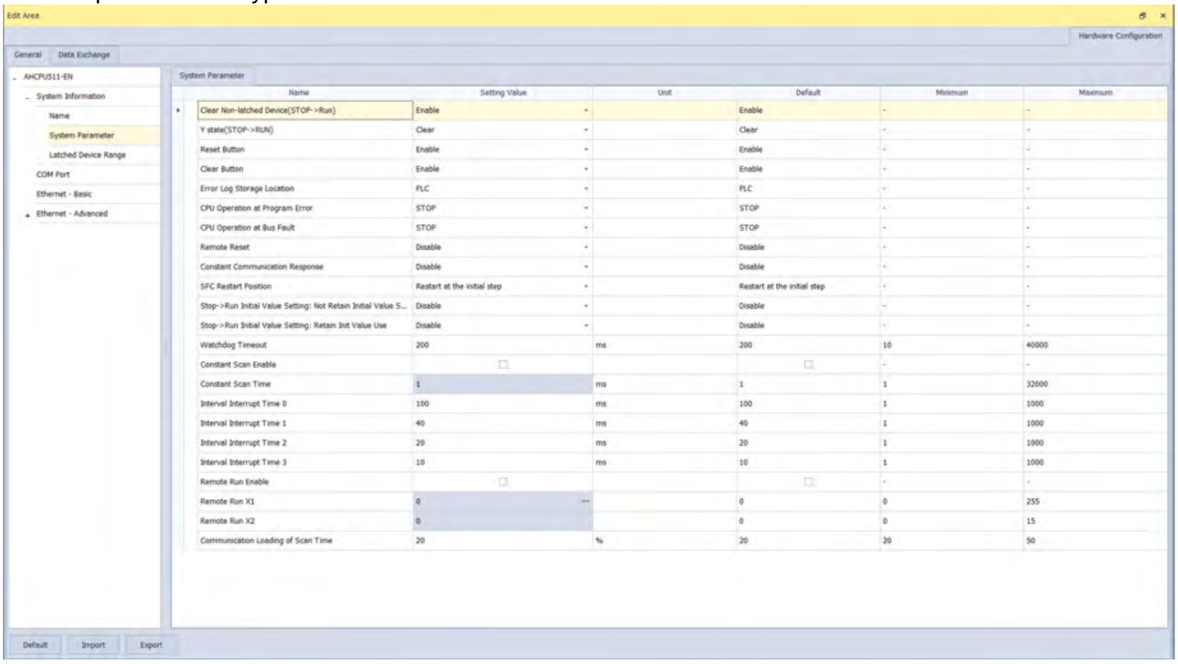


After the project is created, you can find the PLC label behind the product name in the project management area. You can change the PLC label in HWCONFIG as it is mentioned above. The PLC label is very useful when you have more than one PLC in the project. This label can be seen as the PLC identity. So that you will not change other PLC parameters by mistake. To prevent errors, when you download/upload the program, the system will remind you to check the name of the PLC CPU and the PLC label.



8.1.3.2 System Settings – System Parameter

The parameters on **System Parameter** table are shown in the following window. You can set appropriate values via a drop-down list or type the values in the box.



- **Clear Non-latched Device (Stop →Run)**

  This determines whether the states and values of the non-latched devices are cleared when the PLC changes from Stop to Run.

  - **Disable:** All the states and values in the non-latched devices stay the same.
  - **Enable:** All the states and values in the non-latched devices are cleared and restored to defaults.

- **Y state (Stop → RUN)**

  This determines the states of the Y devices when the CPU module begins to run or stop.

  - **Off:** All Y devices are set to OFF.
  - **Keep:** The states of the Y devices stay the same.

- **Reset Button**

  Use the parameter here to enable or disable the function of reset button (RST) on the CPU module.

  - **Disable:** The function of reset button (RST) on the CPU module is closed.
  - **Enable:** The function of reset button (RST) on the CPU module is available.

- **Clear Button**

  Use the parameter here to enable or disable the function of clear button (CLR) on the CPU module.

  - **Disable:** The function of clear button (CLR) on the CPU module is closed.
  - **Enable:** The function of clear button (CLR) on the CPU module is available.

- **Error Log Storage Location**

  This specifies where to store the error log.

  - **PLC**: Store error logs in the PLC. The PLC can store up to twenty error logs. If there are more than twenty error logs, the oldest error log is overwritten by the latest error log.
  - **PLC & SD Card**: When there are more than twenty error logs, the oldest error log is backed up to the memory card before the oldest error log is overwritten in the PLC.

- **CPU Operation at Program Error / Bus Fault**
  This determines how the CPU module reacts when a minor error occurs. If an error occurs, the state of the CPU may change. Users can define what action should the CPU takes.
  - **Stop**: the CPU module stops running and sends an error.
  - **Keep Run**: the CPU module keeps running and sends an error.

- **Remote Reset**
  This determines if the CPU module can be reset through a remote system.
  - **Disable:** Users can NOT reset the CPU module to its default settings through ISPSoft remotely.
  - **Enable:** Users can reset the CPU module to its default settings through ISPSoft remotely.

- **Constant Communication Response**
  If the **Enable** checkbox is not selected, commands received through the communication ports will not be processed until the scan cycle is complete. If the **Enable** checkbox is selected, commands received through the communication ports will be processed every specific period of time. However, the scan procedure is interrupted when the system processes commands received through the communication ports. As a result, the scan time will be prolonged if the **Enable** checkbox is selected. Make sure that the operation of the system is not affected when the function is used.

- **SFC Restart Position**
  This determines from which step the CPU module starts to execute when the state of CPU module changes from Stop to Run.
  - Restart at the initial step: Start executing from the initial step. Define the initial step in ISPSoft.
  - Restart at the last executed step of the previous operation: Start executing where the CPU module last left at.

- **Stop → RUN Initial Value Setting: Not Retain Initial Value Setting**
  This determines whether the states and values of the non-latched devices are restored to initial values when the PLC changes from Stop to Run.
  - **Disable**: All the states and values in the non-latched devices stay the same.
  - **Enable**: All the states and values in the non-latched devices are restored to initial values when the PLC changes from Stop to Run. .

- **Stop → RUN Initial Value Setting: Retain Init Value Use**
  This determines whether the states and values of the latched devices are restored to initial values when the PLC changes from Stop to Run.
  - **Disable**: All the states and values in the latched devices stay the same.
  - **Enable**: All the states and values in the latched devices are restored to initial values when the PLC changes from Stop to Run. .

- **Watchdog Timeout**
  This parameter sets a timeout during which the program is scanned. The CPU module sends an error if the program execution exceeds the watchdog time.

- **Constant Scan Enable**

  This sets the minimum scan cycle time.

  - **Disable**: Disables this function.
  - **Enable**: When the actual scan cycle time is less than the setting time, the CPU module waits until the setting time is met, and then starts the next scan. When the actual scan time is longer than the setting time, the CPU module starts the next scan after the actual scan time completes.

- **Constant Scan Time**

  If you selected **Enable** in the previous option, you set the scan cycle time here. If the actual scan time is less than the setting time, the CPU module waits to begin the next scan until the setting time is met. If the actual scan time is larger than the setting time, the CPU module ignores the setting time and operates according to the actual scan time. If you set the scan time longer than the watchdog timeout set, a watchdog timeout occurs when the CPU module operates.

- **Interval Interrupt Time 0~3**

  An AH500 series CPU module provides four interrupts. You can set intervals of triggering the interrupts in Task, corresponding to Task252~255.

- **Remote Run Enable**

  If the **Enable Remote Run** checkbox is selected, you can specify an X device which controls the state of the CPU module. For example, the CPU module runs when the state of X0.0 is ON, and the CPU module stops running when X0.0 is OFF.

- **Communication Loading of Scan Time**

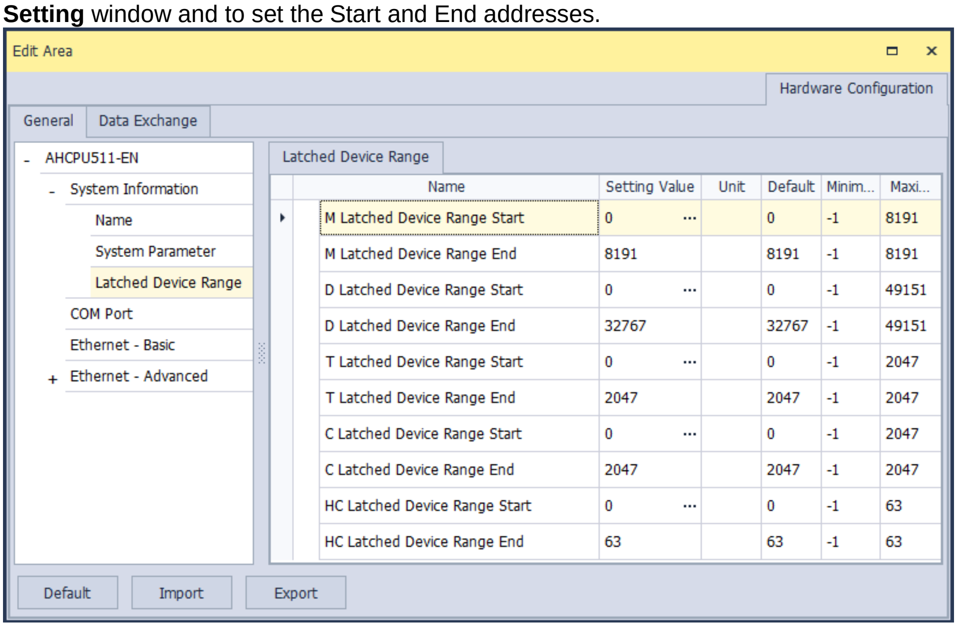
  If the **Communication Loading of Scan Time** checkbox is selected, you can specify the ratio of communication and scan time. Currently this function is only available for AH5x1 and AH560 Series.

- **Redundancy**

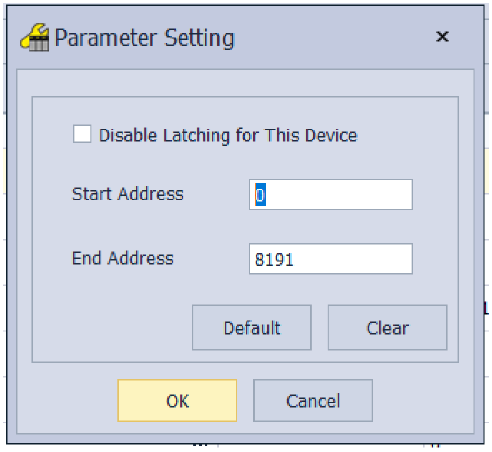
  Currently this function is only available for AH560 Redundancy Series. Once this function is enabled, the backplane here will be changed to extension backplane automatically. And you will find two main backplanes in the Hardware Configuration area. The right backplane is the mirrored version of the left backplane. Thus you can NOT add, remove, or modify the backplane on the right. Refer to AH560 Redundancy System Operation Manual for more information.

8.1.3.3 Latched Device Range

Click the **Latched Device Range** option to set the range of latched devices. Click … to open the **Parameter Setting** window and to set the Start and End addresses.

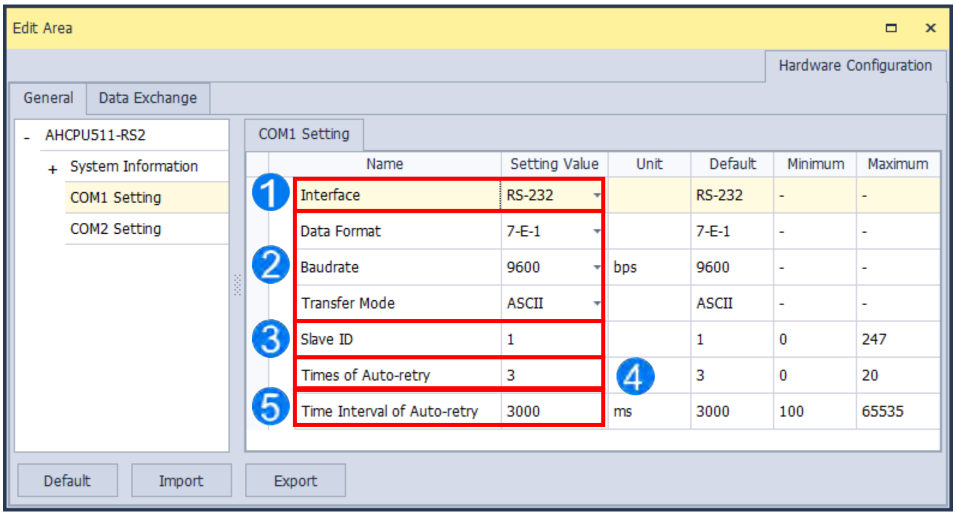


Select the **Disable Latching for This Device** and then the value in this device is not retainable. Click **Clear** to clear the values. Click **Default** to restore the values to the default values



8.1.3.4 COM Port

If the CPU module is equipped with two communication ports, there are two setting areas for the two communication ports, and the two communication ports are set individually.



❶ You can select **RS232**, **RS485**, or **RS422** in the **Communication Type** drop-down list box. For AH560 Series PLC, only RS232 and RS485 are supported.

❷ Users can set the communication protocol parameters. If the **RTU** option button is selected in the **Transfer Mode** section, the **8 bit** option button in the **Data Length** section is automatically selected.

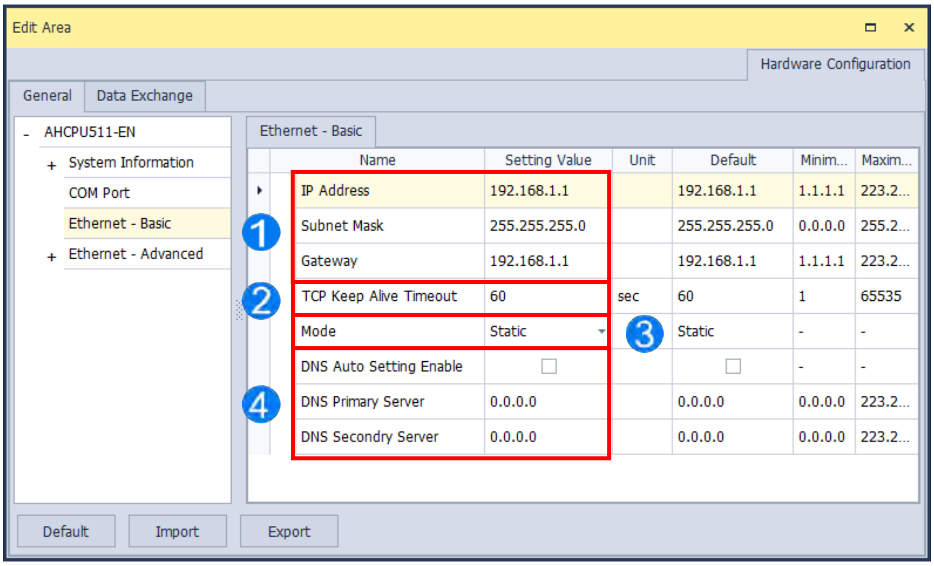
❸ Users can set a station address. A device on a network can be identified by the station address of the device. The station address of a device on a network can not be the same as the station address of another device on the same network. The station address of a device must be in the range of 0 to 247. If the communication port functions as a slave, and there are other slaves, the station address of the communication port can not be 0, since station address 0 has the meaning of broadcasting to all slaves in a communication protocol. If a master specifies in a data packet that data must be sent to station address 0, the data will be sent to all slaves. No matter what station address of these slaves are, these slaves will receive the data packet.

❹ If the sending of a command fails, the CPU module will retry the sending of the command. Users can set the number of times the sending of a command is retired in this box. The number of times the sending of a command is retired must be in the range of 0 to 20.

❺ Users can set an interval of retrying the sending of a command. If the sending of a command fails, the CPU module will retry the sending of the command every specific period of time. The interval of retrying the sending of a command must be in the range of 100 milliseconds to 65535 milliseconds.

8.1.3.5 Ethernet - Basic

If a CPU module is equipped with an Ethernet port, you can click the option of **Ethernet–Basic** to set up the communication parameters.



❶ If users select **Static** in the **Mode**, they can specify an IP address, a subnet mask, and a gateway address.

❷ You can set the time for the connection to keep alive here. If no data is transmitted from the CPU module on a network, and the keep alive period has elapsed, the CPU module will be disconnected from the network automatically.

❸ If **Dynamic** is selected in the **Mode**, the IP address, the subnet mask, and the gateway address are assigned by a **DHCP/BOOTP** server.

❹ If AH5x1 or AH560 Series is used, you can set the DNS addresses here.

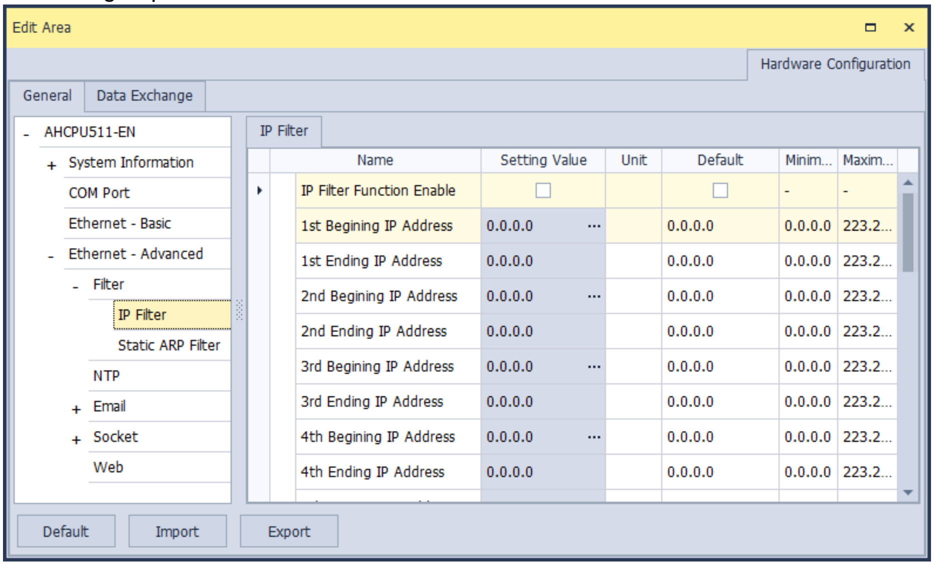
8.1.3.6 Ethernet – Advance: Filter

If a CPU module is equipped with an Ethernet port, users can enter this page. For example, AHCPU5xx-EN is equipped with an Ethernet port. Click the **Ethernet–Advance** to unfold the setting options.

In this option “Filter”, devices on a network can set to be filtered to ensure that devices communicating with the CPU module are allowed.

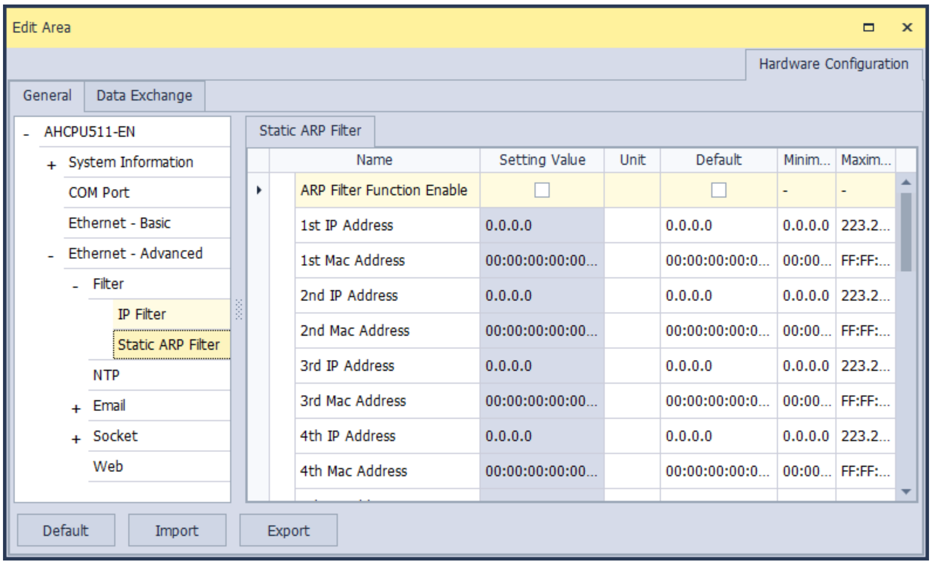
- **IP Filter**

  If the **IP Filter Function Enable** checkbox is selected, devices whose IP addresses are listed in the table will be allowed to communicate with the CPU module, and the CPU module will discard data packets sent from devices whose IP addresses are not listed in the table. The steps of setting the function are as follows. Sixteen groups of IP address at most can be listed in the table.



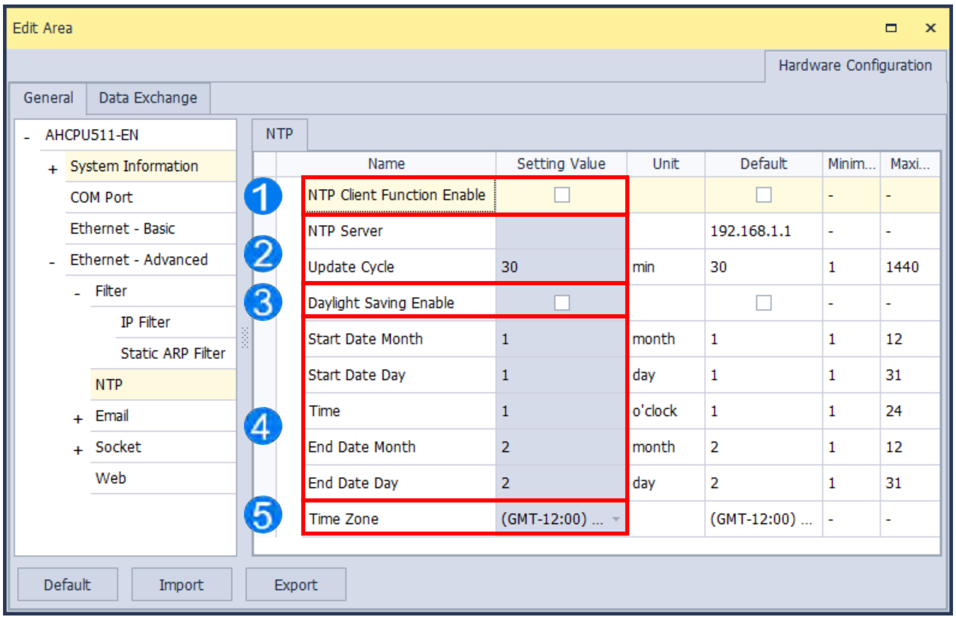
- **Static ARP Filter**

  Users can use this function to set MAC addresses and corresponding IP addresses. The MAC address of every device is unique. If the MAC address of device A is known, the MAC address can be bound to the IP address assigned to device A. The CPU module will regard the IP address as the exclusive address of device A. Even if device B is assigned the same IP address, the CPU module does not respond to device B. The steps of setting the function are as follows. Sixteen groups of addresses at most can be listed in the table.



8.1.3.7 Ethernet – Advance: NTP

Select the **NTP Client Function Enable** checkbox, and then set the related parameters to enable the function of synchronizing the real-time clock in the CPU module to an NTP server, and carry out the related setting.



❶ **NTP Client Function Enable:** Select this option to enable this function.

❷ **Update Cycle:** Users can set the IP address of an NTP server. The CPU module corrects the time inside itself by connecting to the server periodically. Users can set an interval of correcting the time in the CPU module. If the interval is thirty minutes, the CPU module will connect to the NTP server every thirty minutes.

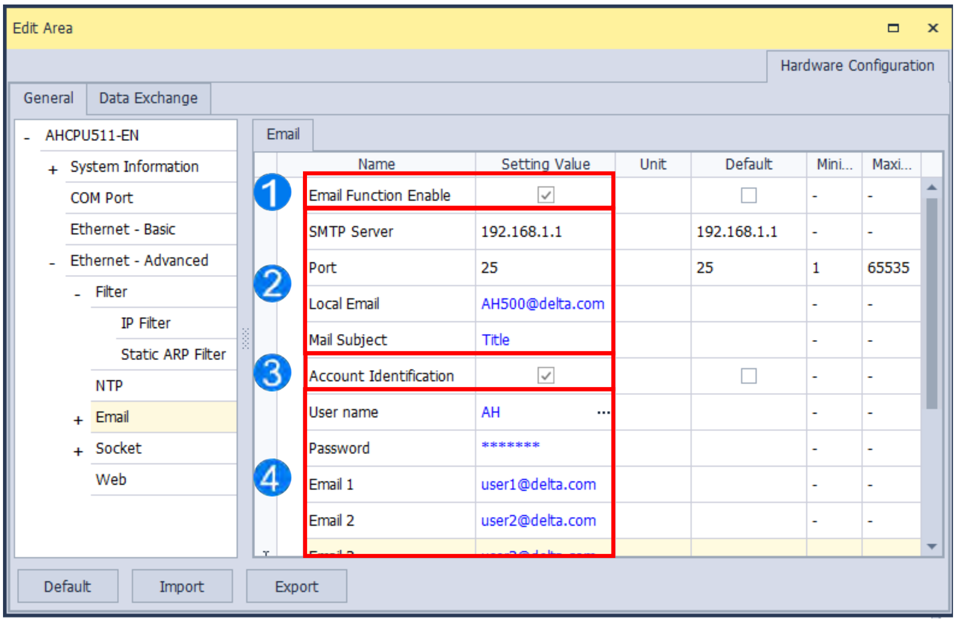
❸ **Daylight Saving Enable:** Select this option to enable this function.

❹ After Daylight Saving Enable is selected, you can set the start and end of month, date and time of the daylight saving.

❺ Users can select a time zone in the **Time Zone** drop-down list box for the NTP.

8.1.3.8 Ethernet – Advance: Email

Select the **Email Function Enable** checkbox, and then set the related parameters for the email-related functions.



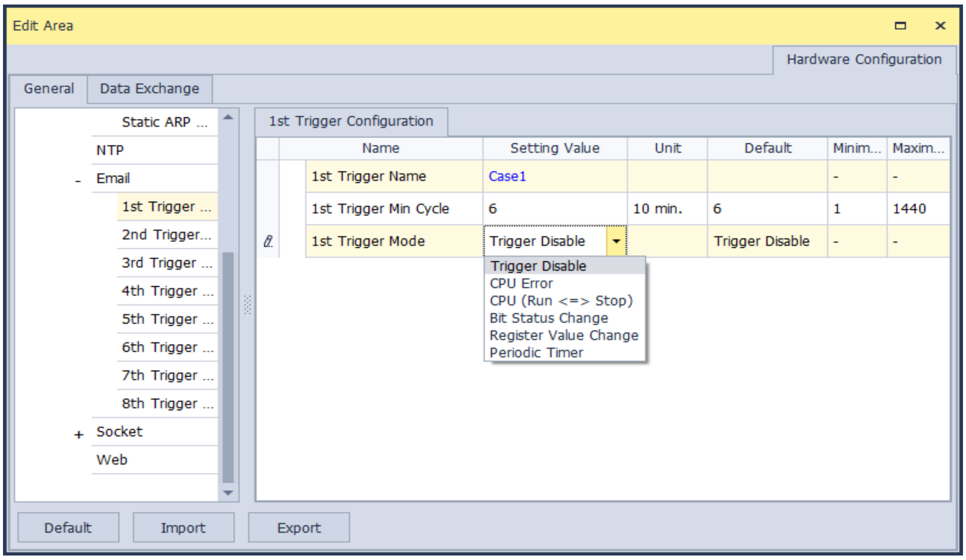
❶ Select **Email Function Enable** to enable the function and then start setting the following parameters.

❷ Set an IP address of SMTP server. Set the COM port of SMTP server at the COM port and set the sender’s email box at local email address. Type a mail subject as the start of the subject of every email.

❸Select **Account identification** checkbox to enable the function. Users can set to authenticate themselves with a user name and a password before logging in to an SMTP server.

❹ Type the target email address of a receiver.

Type a trigger name in **Trigger Name box** and a minimum interval in **Trigger Min Cycle** in the **Trigger Setting** table. And then select a trigger condition on the drop-down list. When the sending condition is met, the system will send an email every a period of time. But the same email will not be sent again within the set interval.



Trigger modes can be set as follows.

- **CPU Error**

If an error occurs in the CPU module, the condition of triggering the sending of an email is met. Please refer to operation manuals for more information about errors occurring in CPU modules. After users select the **CPU Error** option button, they have to select **Fatal Error Only** or **All Errors** in the drop-down list at the right side of the option button.

a) **Fatal Error Only**: If a fatal error occurs in the CPU module, the condition of triggering the sending of an email is met and an email will be sent.

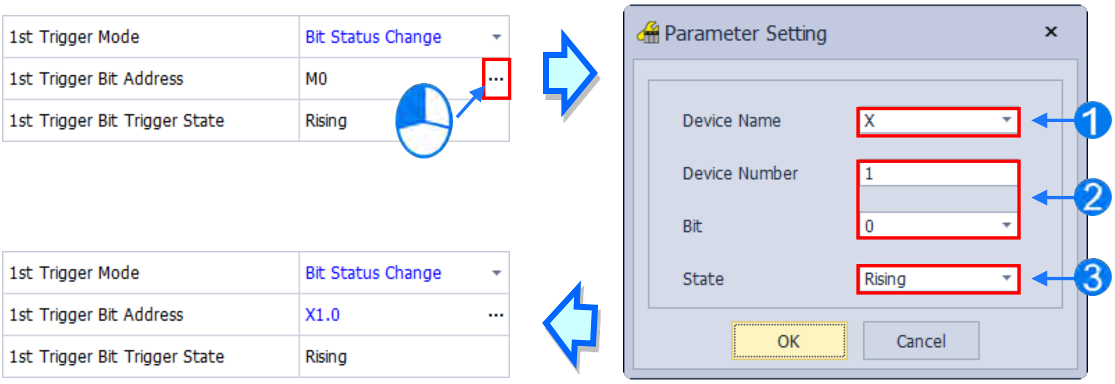
b) **All Errors**: If an error occurs in the CPU module, the condition of triggering the sending of an email is met and an email will be sent.

- **CPU (RUN<=>STOP)**

When the CPU module begins to run, or when the CPU module stops running, the condition of triggering the sending of an email is met and an email will be sent.

- **Bit Status Change**

If the state of a bit device specified meets a condition set, the sending of an email will be triggered and an email will be sent. For example, if X0.0 is turned from OFF to ON, the condition of triggering the sending of an email will be met. If users want to set a condition, they can click ... button in the following window.



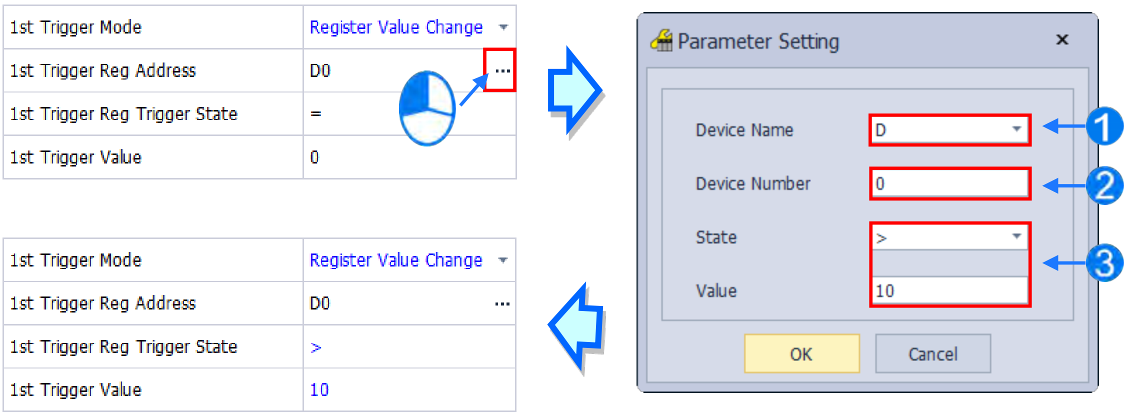
❶ **Device Name**: Users can select a device type in the **Device Name** drop-down list box.

❷ **Device Number & Bit**: Users can type a device address in the **Device Number** box. If the device type selected is X/Y, the users have to specify a bit number.

❸**State**: Users can select **Rising** or **Falling** in the **State** drop-down list.

- **Register Value Change**

If the value in a device specified meets a set condition, the sending of an email will be triggered and an email will be sent. For example, if the value in D0 is larger than 10, the condition of triggering the sending of an email will be met and an email will be sent. If users want to set a condition, they can they can click ··· button in the following window.



❶ **Device Name**: Users can select a device type in the **Device Name** drop-down list.

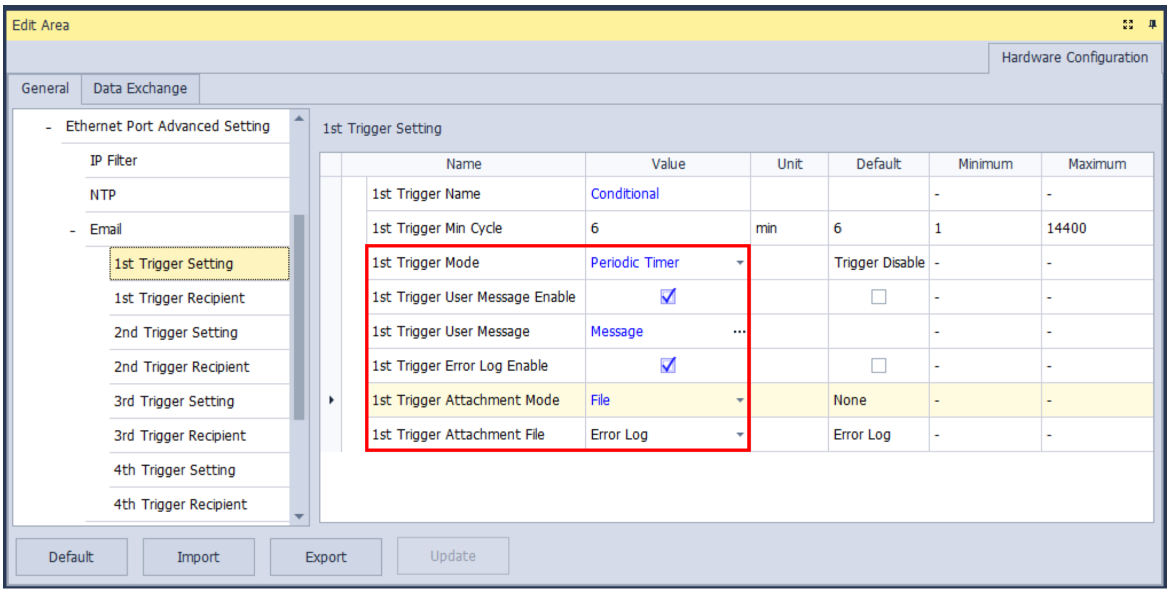
❷ **Device Number**: Users can type a device address in the **Device Number** field.

❸ **State & Value**: Users can set s condition of triggering the sending of an email here.

- **Periodic Timer**

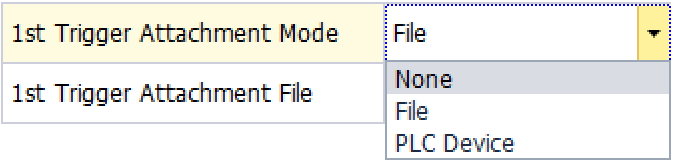
An email is sent periodically. How often an email is sent depends on the interval typed in the **Trigger Min Cycle** box in the **Trigger Setting** section.

Where any trigger mode is set, the user message and error log related parameters will show up.



Select the **Trigger User Message Enable** box and then click ⋯ button to the right side of **Trigger User Message**. Type some content as the email text in the pop-up window.

If users select the **Error Log Enable** checkbox in the **Trigger Setting** table, the error log will be added to the email content automatically.



The options on the drop-down menu of **Trigger Attachment Mode** decide whether to add an attachment to the email. Please make sure the maximum size of the email file allowed before setting an attachment. For more information, refer to relevant operation manuals.

- **None**

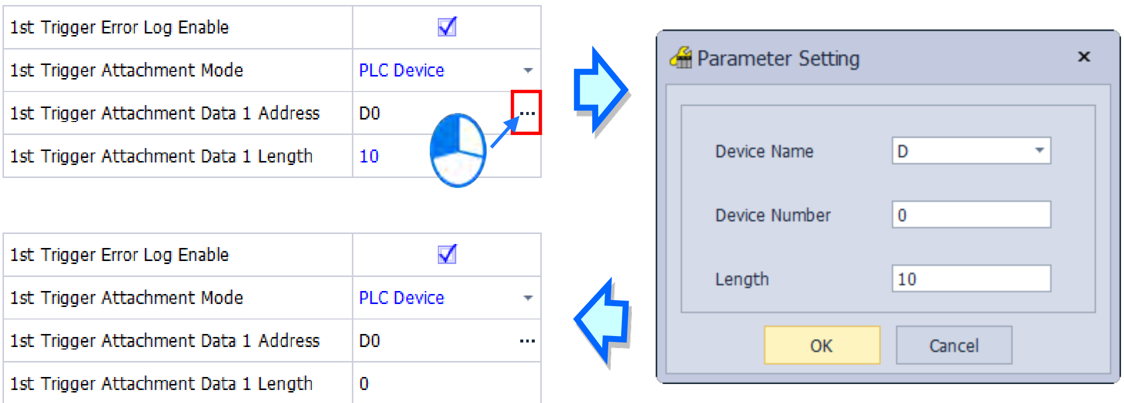
If this option button is selected, no attachment will be inserted.

- **File**

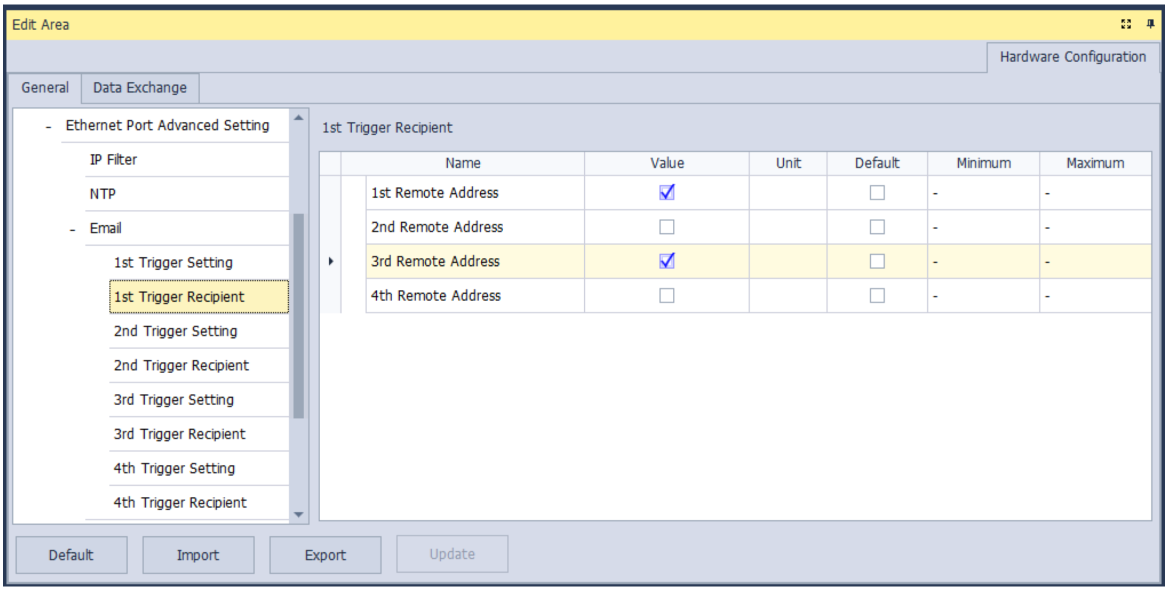
Users can select an error log in the memory card, or the system backup file in the memory card as the attachment of the email.

- **PLC Device**

If this option button is selected, the system automatically retrieves the states of the devices, or the values in the devices listed in the table as the attachment when the email is sent. After this option button is selected, users can click ⋯ button in the following window to open the **Attachment** window. Two groups of devices at most can be set. For example, if the condition is met, the values in D0~D9 will be sent as an attachment.

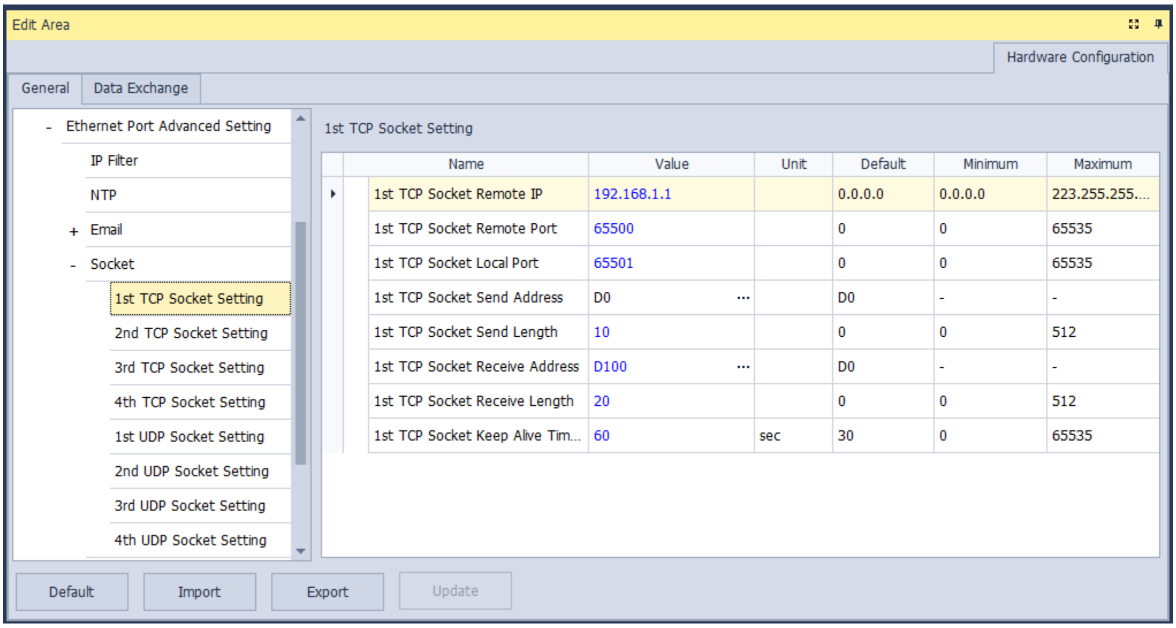


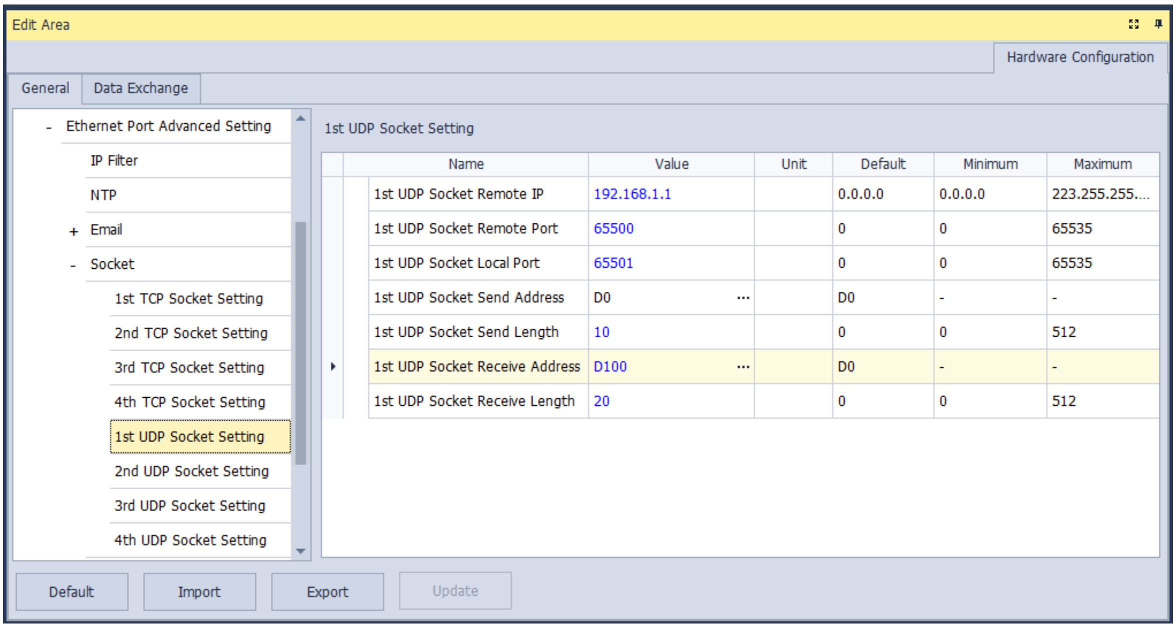
Select the target email address of a receiver when the condition of sending an email is met in **Trigger Receiving** table. And the specific email box is set in the **Email** section.



8.1.3.9 Ethernet – Advance: Socket

In the **Socket** table, you can set COM port parameters for data transmission through Ethernet; however, you need to use this function along with specific API instructions. For more details, refer to the AH500 Programming Manual. The AH500 CPU PLC supports data transmissions between the CPU module and other CPU module or device through sockets and the communication protocols including TCP and UDP are supported; four groups of connections can be set respectively for each protocol.

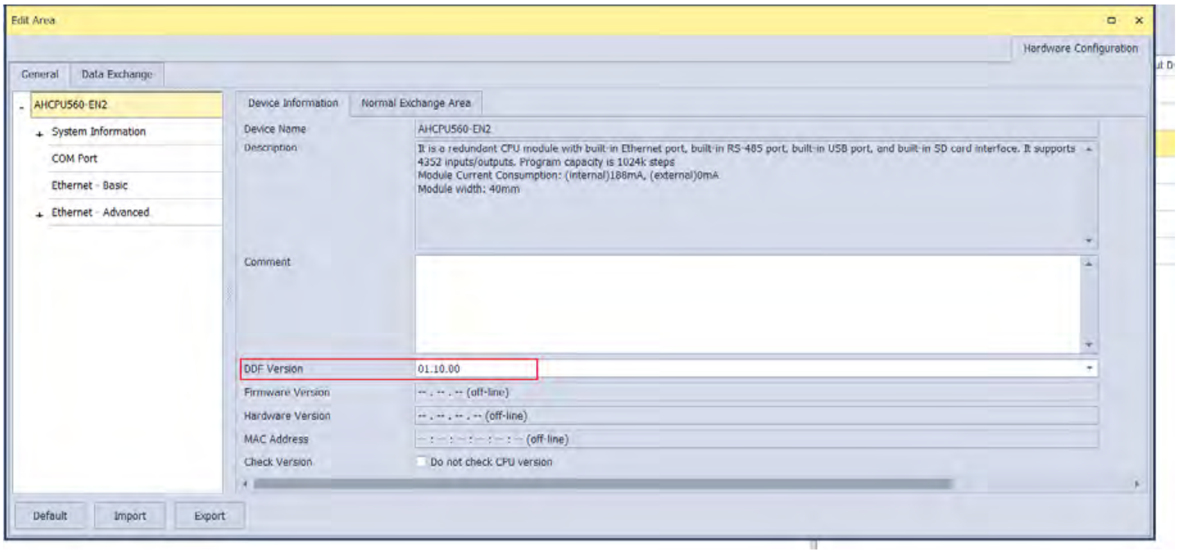




The parameters in the **TCP Socket Setting** are the same as the parameters in the **UDP Socket Setting** except that there is no **Keep Alive Timer** parameter in the UDP Socket Setting. The parameters in the TCP and UDP Socket Setting are described below.

- **Remote IP**: Users can set a remote IP address.
- **Remote Port**: Users can set a communication port used by the remote device for this TCP connection. The port number must be within the range between 0 and 65535.
- **Local Port**: Users can set a communication port used by the local CPU module for this connection. The port number must be within the range between 0 and 65535.
- **Send Address**: Uses can set the initial device in the CPU module where data which will be sent is stored.
- **Send Length**: Users can set the length of data which will be sent by the local CPU module. The length must be within the range between 0 and 4096 words.*1
- **Receive Address**: Uses can set an initial device in the CPU module where data which will be received is stored.
- **Receive Length**: Users can set the length of data which will be received by the local CPU module. The length must be within the range between 0 and 4096 words. *1
- **Keep Alive Timer**: Users can set a maximum keep alive time for the connection. If no data is transmitted, and the keep alive period has elapsed, the CPU module will terminate the connection automatically.

*1: For AHCPU5x1-EN (FW V2.03 or later) and AHCPU560-EN2 (FW V1.10 or later), the supported length is 4096 words at most. For previous firmware versions and AHCPU5x0, the supported length is 500 words at most. You can use change the DDF version in HWCONFIG to have a bigger range.



The port number used by the local CPU module and the port number used by the remote device cannot be the same, and the devices where data which will be sent is stored cannot overlap the devices where data which will be received is stored. If the IP address of the remote device is 192.168.1.100, the port number used by the remote device is 65500, and the port number used by the local CPU module is 65501, the remote device and the local CPU module can transmit data through this TCP connection.

If the local CPU module wants to send 10-word data to the remote device, the data will be stored in D0~D9 before the data is sent. If the local CPU module receives 20-word data from the remote device, the data will be stored in D100~D119.

If the length of data received is larger than the length set, the first 20-word data will be stored in D100~D119, and the data after the first 20-word data will be discarded. Likewise, if the length of data received is less than the length set, the data will be stored in the devices starting from D100, and the values in devices where no new data is stored will be retained.

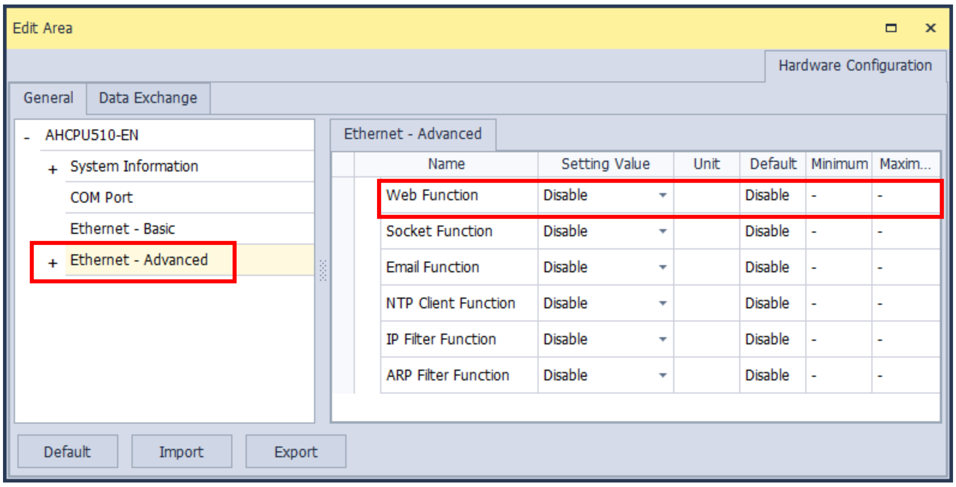
If no data is transmitted, and 60 seconds have elapsed, the CPU module will close the socket, and terminate the connection.

8.1.3.10 Ethernet – Advance: Web

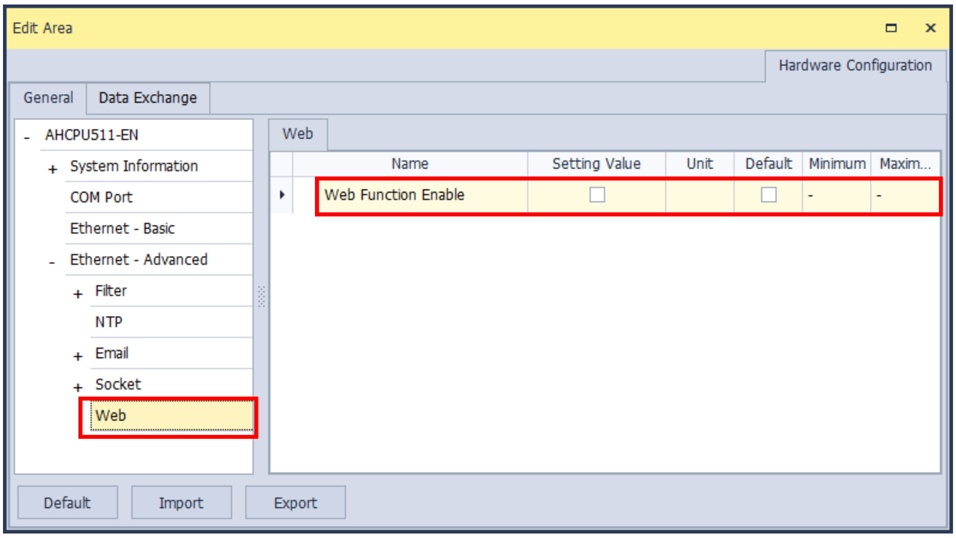
Select the **Enable Web Function** checkbox to enable the built-in web monitoring function of the CPU module. Enter the IP address of the CPU module on the search bar. After the parameter is downloaded to the CPU module correctly, users can view the parameters, including I/O, devices, system log, and network configurations of the CPU module through a web browser. Refer to section 11.4 for more information.

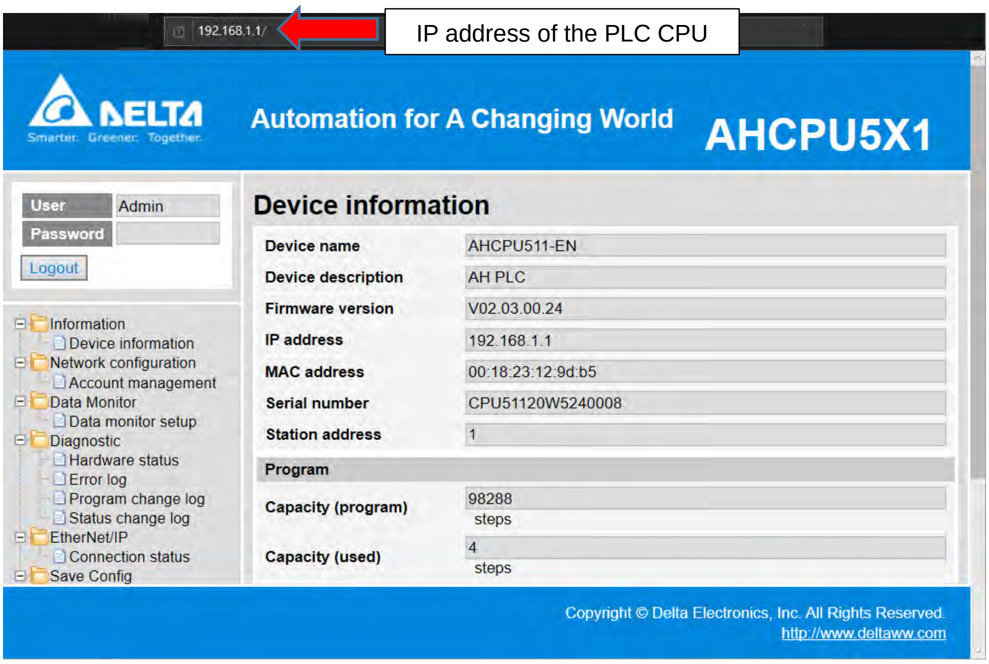
The web page function is only available for AH5x0-EN Series (FW V1.08 or later) and AH5x1-EN (FW V2.03 or later).

◆ AH5x0 Basic CPU PLC Series (AHCPU500/510/520/530-EN)



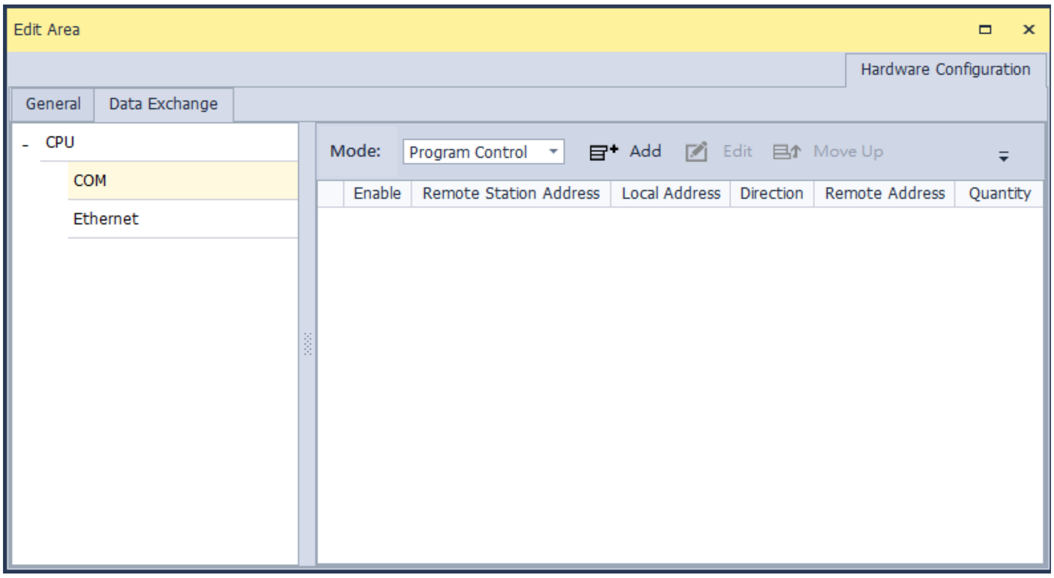
◆ AH500 Advanced CPU PLC Series (AHCPU501/511/521/531-EN)





8.1.3.11 Data Exchange

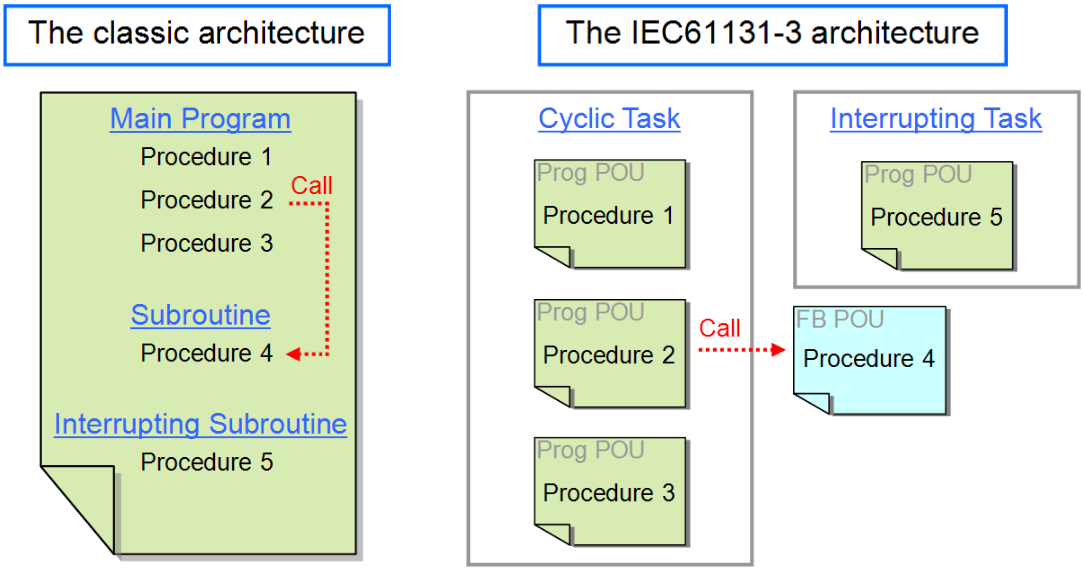
AH500 series can exchange data with another Ethernet PLC not only through instructions, but also by a table interface. AH500 Basic CPU modules (AHCPU500/510/520/530) can exchange data via MODBUS TCP and AH500 Advanced CPU modules (AHCPU501/511/521/531) can exchange data via MODBUS TCP and MODBUS. Refer to section 11.3 for more information.



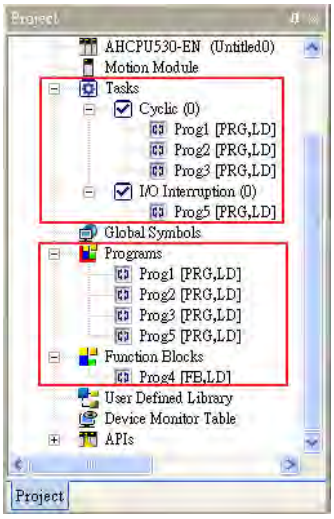
8.2 Setting Interrupts

8.2.1 Program Architectures

AH500 series PLCs uses IEC 61131-3. In the IEC 61131-3 architecture, a program is divided into several program organization units (POUs). Every program organization unit can be developed independently, and can be assigned a task.
The Classic architecture and the IEC 61131-3 architecture are shown below.



The figure below is a project created in ISPSoft. Program 4 is a POU of the function block type. The cyclic programs and the interrupt program are POUs of the program type.

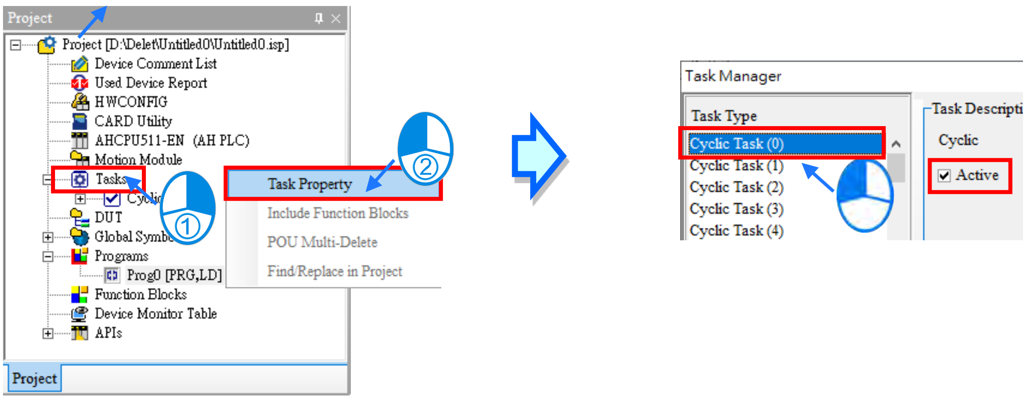


The interrupts supported by AH500 series CPU modules will be introduced in the following sections. Please refer to ISPSoft User Manual for more information about creating interrupts, and writing programs.

8.2.2 Tasks Supported by AH500 Series CPU Modules

The number of interrupts supported by an AH500 series CPU module is 288. There are mainly two types of tasks.

- Cyclic task 0~cyclic task 31 (32 cyclic tasks)
  Cyclic tasks are executed in every scan cycle. A cyclic task can be activated/inactivated by means of the instruction TKON/TKOFF. Users can set the initial state of a cyclic state.
  Please refer to the figure below. After users click a cyclic task in the **Task Manager** window, they can set the initial state of the cyclic task in the **Task Description** section. If the **Active** checkbox is unselected, the cyclic task will not be executed until it is activated by the instruction TKON in the POU assigned to another cyclic task. Please refer to AH500 Programming Manual for more information about the instructions TKON and TKOFF.



- Interrupt task 0~interrupt task 255 (256 interrupt tasks)
  AH500 series CPU modules provide various kinds of interrupts. The interrupts provided by AH500 series CPU modules will be introduced in the following sections.

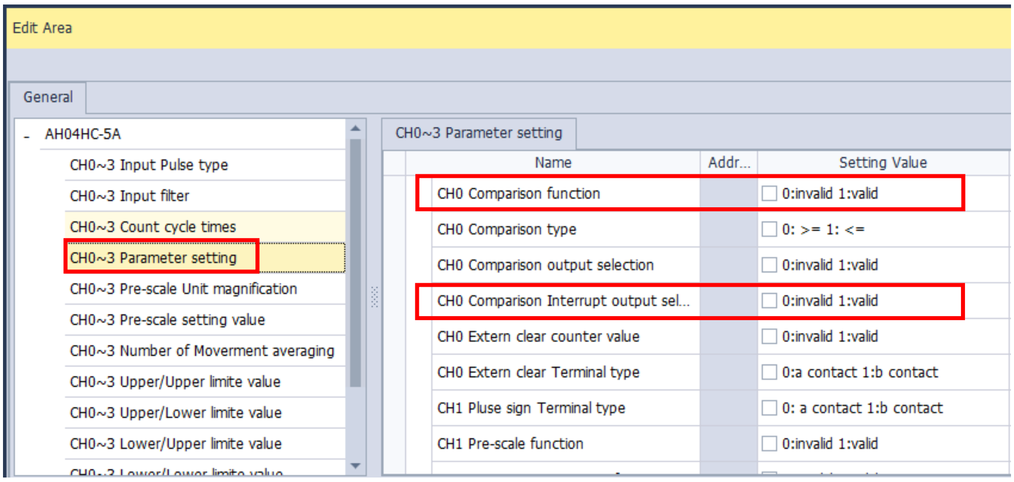
8.2.3 I/O Interrupts

There are 32 I/O interrupts (I0~I31).

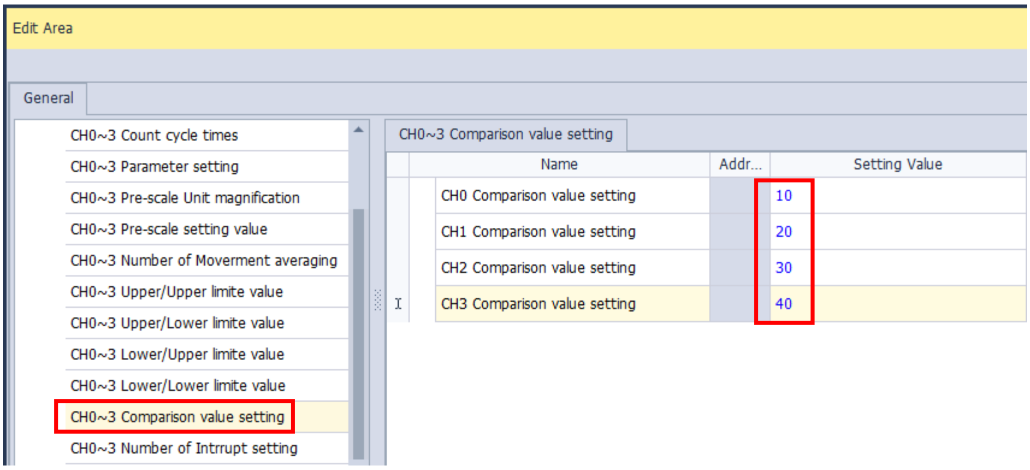
I/O interrupts are used by special high-speed modules. Users can set interrupt conditions and interrupt numbers for a special high-speed module by means of HWCONFIG, and download the program created in ISPSoft to the special high-speed module. If an interrupt condition is met when the high-speed module runs, the corresponding interrupt will be executed.

Take AH04HC-5A for instance. The steps of setting AH04HC-5A are as follows.

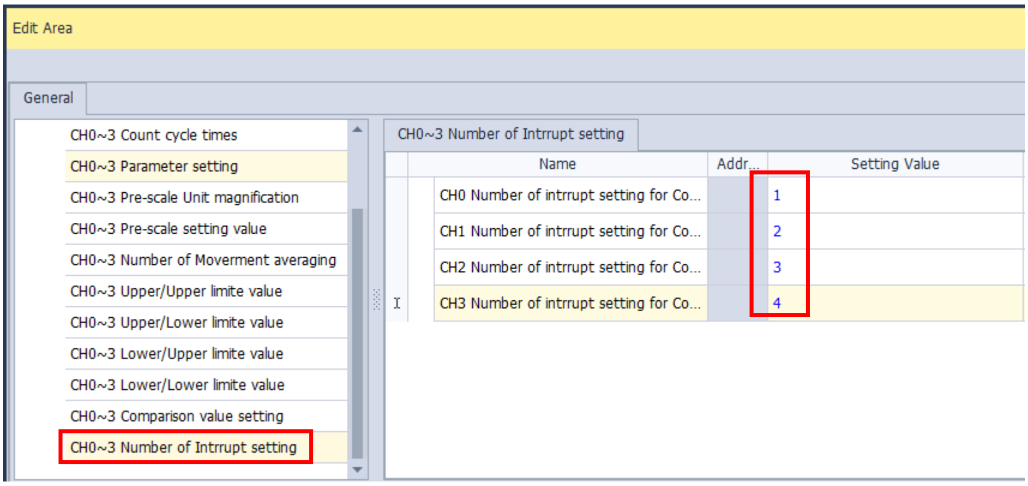
(1) After users click **CH0~3 parameter setting** in the **Parameter Setting** window, they can set **CH1/CH2/CH3/CH4 compariosn function**, and **CH1/CH2/CH3/CH4 comparison interrupt output selection**.



(2) After the users click **CH0~3 comparison value setting**, they can type comparison values in the **Initial** cells.



(3) After the users click **CH0~3 number of interrupt setting**, they can type interrupt numbers in the **Initial** cells. If the number of pulses received by a channel is the same as the comparison value set for the channel, the corresponding I/O interrupt will be executed. However, if no POU is assigned to the I/O interrupt, or the POU assigned to the I/O interrupt is not downloaded to the special high-speed module, an error will occur in the special high-speed module.

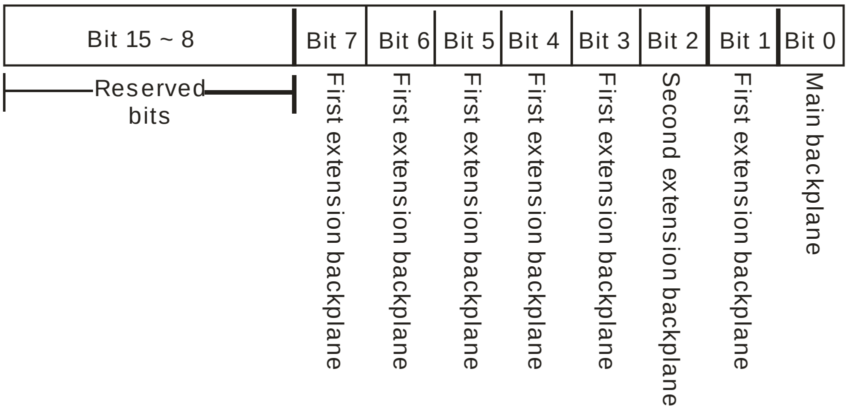


8.2.4 Low Voltage Detection Interrupt

The terminals VS+ and VS- on AHPS05-5A can check whether the external voltage is 24 volts. If the external voltage is abnormal, the interrupt subroutine I34 will be executed.

Note: If the voltage supplied to a backplane is abnormal, the corresponding bit in SR731 will be set to ON. After the external voltage supplied to the backplane returns to normal, the bit will be set to OFF. Bit 0~bit 7 in SR731 are for backplanes. The remaining bits in SR731 are reserved bits.

SR731



8.2.5 Communication Interrupts

A communication interrupt can be used as the instruction RS, that is, the reception of a specific character triggers a communication interrupt. A communication interrupt can also be used as a general interrupt. Please refer to AH500 Programming Manual for more information about the instruction RS.

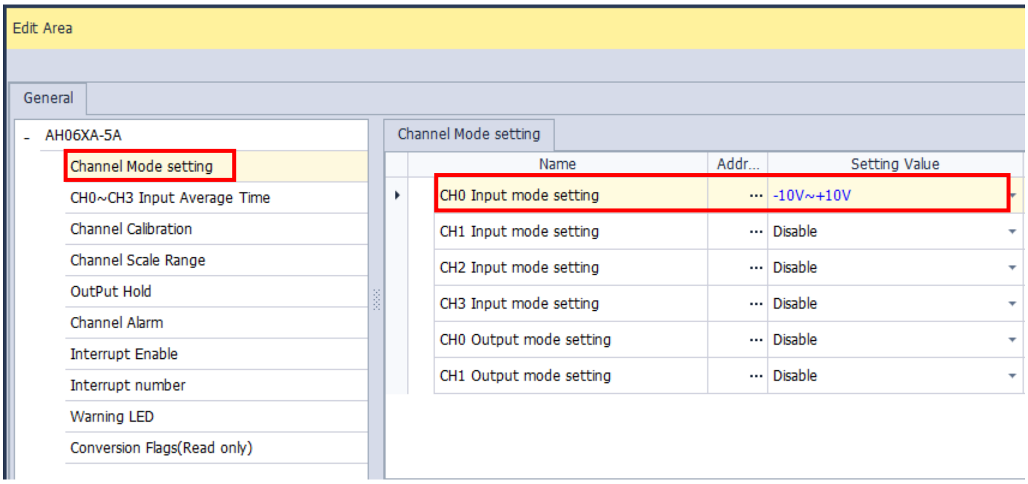
COM1: I32

COM2: I33

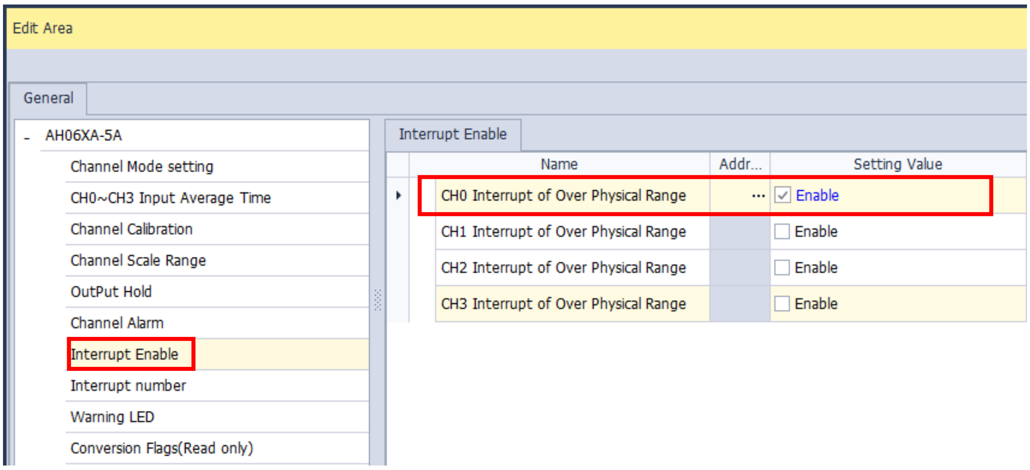
8.2.6 External Interrupts

There are 212 external interrupts (I40~I251). If a peripheral device sends an interrupt request, the corresponding interrupt task will be executed. Take AH06XA-5A for instance. The steps of setting AH06XA-5A are as follows.

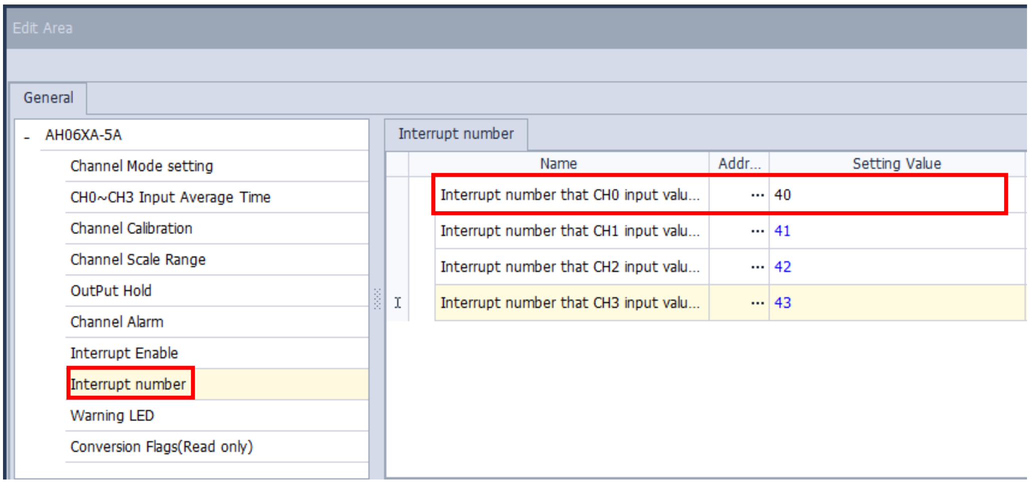
(1) After users click **Channel mode setting** in the **Parameter Setting** window, they can set **CH0/CH1/CH2/CH3 input mode setting**.



(2) After the users click **Interrupt enable**, they can set **CH0/CH1/CH2/CH3 interrupt of over physics Range**.



(3) After the users click **Interrupt number**, they can type interrupt numbers in the **Initial** cells.



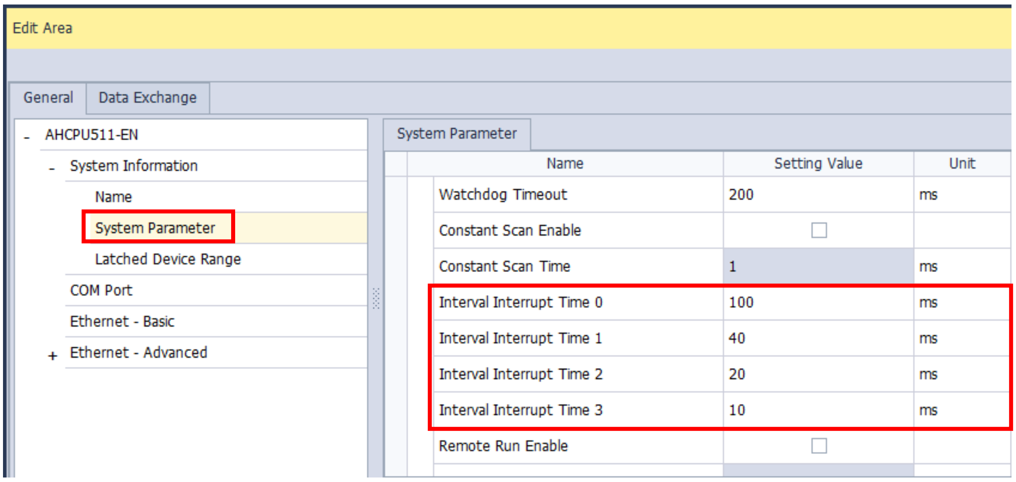
If an input signal received by input channel 0 exceeds the range, the external interrupt I40 will be triggered. However, if no POU is assigned to the external interrupt I40, or the POU assigned to the external interrupt I40 is not downloaded to the special high-speed module, an error will occur in AH06XA-5A.

- Interrupts can not be executed simultaneously. If other interrupts are triggered when one interrupt is executed, the interrupts triggered will be recorded. After the execution of the interrupt is finished, the interrupt which has priority over the other interrupts will be executed next.
- If an interrupt is triggered repeatedly when it is executed, only one interrupt will be recorded, and the other interrupts will be ignored.

Users can not set two different interrupt conditions for one interrupt number. For example, if I220 is used by a network module, it can not be used by an analog input/output module.

8.2.7 Timer Interrupts

There are four timer interrupts (I252~I255).
Timer interrupt 0 (I252): The default value is 100 milliseconds (1~1000 milliseconds).
Timer interrupt 1 (I253): The default value is 40 milliseconds (1~1000 milliseconds).
Timer interrupt 2 (I254): The default value is 20 milliseconds (1~1000 milliseconds).
Timer interrupt 3 (I255): The default value is 10 milliseconds (1~1000 milliseconds).
A timer interrupt is executed every specific period of time. For example, the timed interrupt task is executed every 10 milliseconds. Users can set the timer interrupts in the **PLC Parameter Setting** window.



MEMO

Chapter 9 Network Configuration (Applicable for AHCPU5X0 Models)

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9.1 Network Configuration Tool–NWCONFIG

9.1.1 Introduction of NWCONFIG

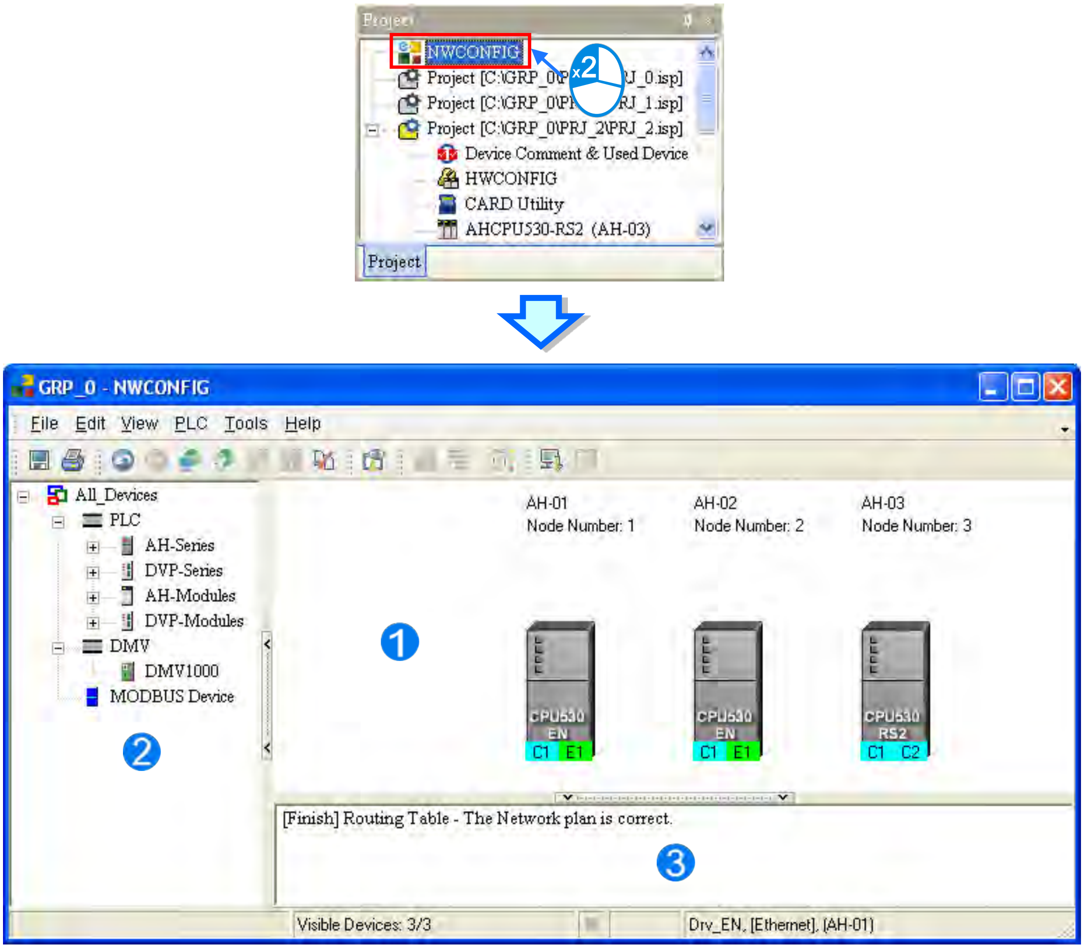
NWCONFIG is the network configuration tool provided by ISPSoft. Users can configure the network in a project and set up a mechanism for data exchange through NWCONGIF. The functions of NWCONFIG are listed below. They will be described in the following sections.

(a) Creating networks in a project, and selecting paths along which data is sent

(b) Performing data exchange through an RS-485 cable–PLC Link

(c) Performing data exchange through Ethernet–Ether Link

NWCONFIG is used to create a network framework for projects, and therefore it is at the top of the project management area. If users want to start NWCONGIF, they can double-click **NWCONFIG** in the project management area.



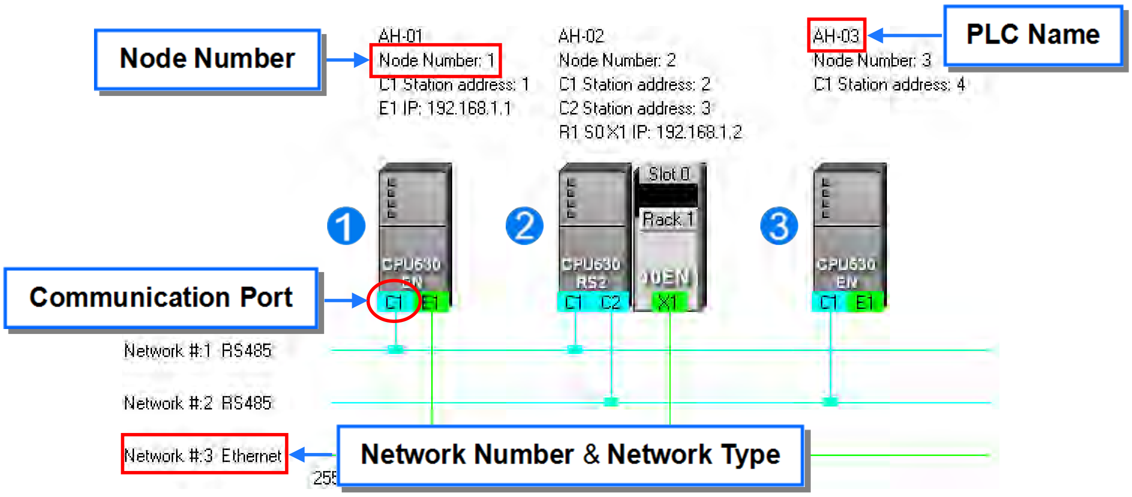
❶ **Working area**: It is a main working area. Users can create a network framework in this area.

❷ **Device list**: All the devices which can be used are listed in a catalog.

❸ **Message display area**: The messages related to operation are displayed in this area.

9.1.2 Basic Knowledge

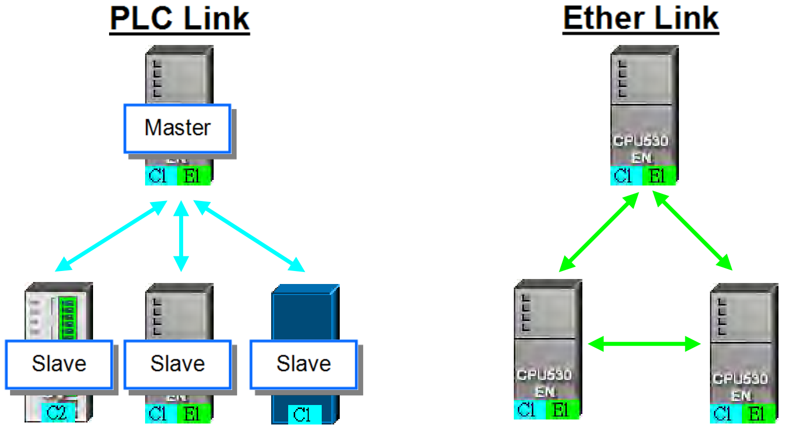
Before creating networks, users need to have some basic knowledge. The basic knowledge is introduced in this section.



- **Device and network**
  A device is the most basic element in a network. It is a PLC, a module, or equipment defined by users. A network is a collection of devices which are interconnected. Every network is assigned a network number. There are RS-485 networks and Ethernet networks. Besides, a physical interface that a device uses to connect to a network is a port of the device. If there are more than two ports on a device, the device can connect to networks which are assigned different network numbers. Please refer to section 9.2.2 for more information about the marking of a port in NWCONFIG.
- **PLC name**
  "**AH-01**", "**AH-02**", and "**AH-03**" in the figure above are PLC names. The PLC name of an AH500 series CPU module depends on the setting in HWCONFIG. Users can identify a device in a network by means of the PLC name of the device. Please refer to section 8.2.2.1 for more information. However, the PLC name of a device which is not an AH500 series CPU module is like a comment on the device. It has little significance.
- **Node and node number**
  A node is a basic unit which can operate independently in a network. ❶ ~ ❸ in the figure above are nodes. ❷ consists of a CPU module and a network module. The network module can not operate by itself, and therefore the CPU module and the network module are regarded as one node.
  Besides, AH500 series CPU modules can forward packets and perform routing. For example, ❸ in the figure above can be monitored through ❶. Before routing is performed, users have to create paths along which data is sent, and assign node numbers to the nodes which forward the data along the paths. Only AH500 series CPU modules can be assigned node numbers, and the node number of a node in a network can not be the same as the node number of another node in the network. After the paths created are downloaded to the PLCs which forward the data along the paths, every PLC has its own routing table. The forwarding of the data is directed on the basis of the routing tables produced.
- **Station address**
  Users can identify a port in an RS-485 network by means of the station address of the port. The station address of a port in a network can not be the same as the station address of another port in the network. Besides, a port is assigned a station address. A port basically represents a station. If a node has several ports, the ports connected to networks must be assigned station addresses.
- **IP address and DHCP mode**
  A port in an Ethernet network is assigned an IP address. The IP address of a port in a network can not be the same as the IP address of another port in the network, and an IP address can not end with 0 or 255. If a node has several Ethernet ports, the Ethernet ports connected to an Ethernet network must be assigned IP addresses.

DHCP is a protocol for assigning dynamic IP addresses to ports in a network. If a server using DHCP assigns an IP address to a port, it assigns a dynamic IP address to the port. In NWCONFIG, the ports which are assigned dynamic IP addresses can not connect to any network.

- **Subnet mask**
  A subnet mask is a mask used to determine what subnet an IP address belongs to. The ports in a network are assigned the same subnet mask. Besides, if the devices in a network want to perform data exchange, they must be in the same domain.
- **PLC Link**
  A PLC Link is a network mechanism for data exchange performed through an RS-485 cable. If there are several nodes in an RS-485 network, users can create a mechanism for data exchange in the network. If the parameters which are set are downloaded to the PLC which functions as a master station, the system of the PLC will perform data exchange through special relays and special registers when the PLC runs.
  A PLC Link is a master/slave model. There is only one master station in an RS-485 network, and the other stations which are slave stations passively receive reading/writing commands from the master station. The slave stations can not exchange data. They have to exchange data through the master station.
- **Ether Link**
  An Ether Link is a network mechanism for data exchange performed through an Ethernet connection. If there are several nodes in an Ethernet network, users can create a mechanism for data exchange in the network, and select a start mode. If the parameters which are set are downloaded to the PLCs in the network, the systems of the PLCs perform data exchange according to the start mode selected when the PLCs run. Besides, only AH500 series CPU modules support Ether Links.
  An Ether Link is not a master/slave model. It allows a node to send reading commands which ask for data to other nodes. The nodes will send the data to the node after they receive the reading commands. Owing to the fact that a node can not send writing commands to other nodes, the use of an Ether Link is safer than the use of a PLC Link. Besides, the system automatically manages the transmission of packets through TCP/IP. Compared with a PLC Link, an Ether Link is more efficient.



***. Please refer to related books or technical documents for more information about RS-485 and Ethernet.**

9.1.3 Communication Setting in NWCONFIG

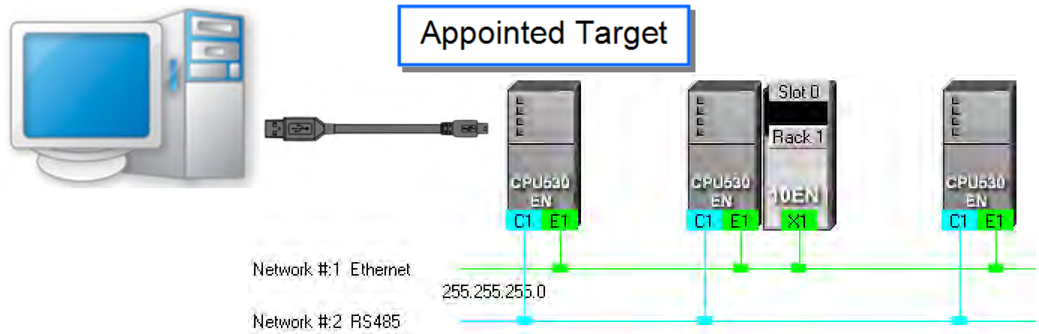
NWCONFIG is used to configure a network. When users configure a network, they have to download parameters to the nodes in the network, upload parameters from the nodes in the network, or monitor nodes in the network. The nodes in the networks created in NWCONFIG may include a device which is not the device for which the ISPSoft project is created, and therefore users have to set the communication parameters in the device. In order to help people select appropriate parameters, the communication mechanism in NWCONFIG is introduced before communication setting is described.

9.1.3.1 Connection Mechanism in NWCONFIG

In the networks created in NWCONFIG, users can download parameters to a single node or multiple nodes, upload parameters from a single node or multiple nodes, and monitor a single node or multiple nodes. Before users download parameters to a single node or multiple nodes, upload parameters from a single node or multiple nodes, or monitor a single node or multiple nodes, they have to select appropriate parameters.

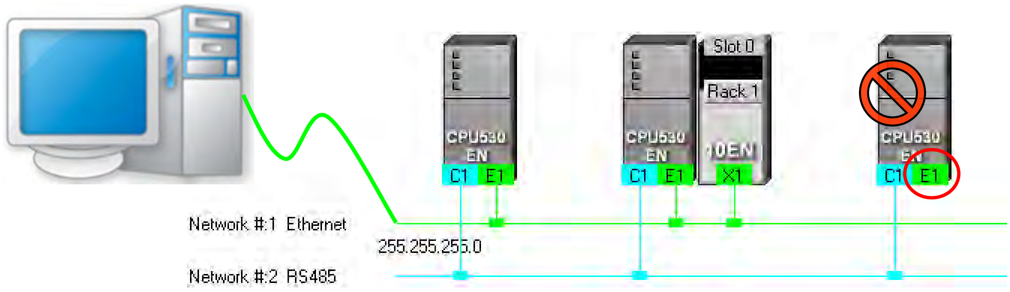
- **Single node**

  Users can download parameters to a single device, upload parameters from a single device, and monitor a single device. Before users download parameters to a single device, upload parameters from a single device, or monitor a single device, they have to make sure that the device specified is the same as the device which is actually connected to the computer.

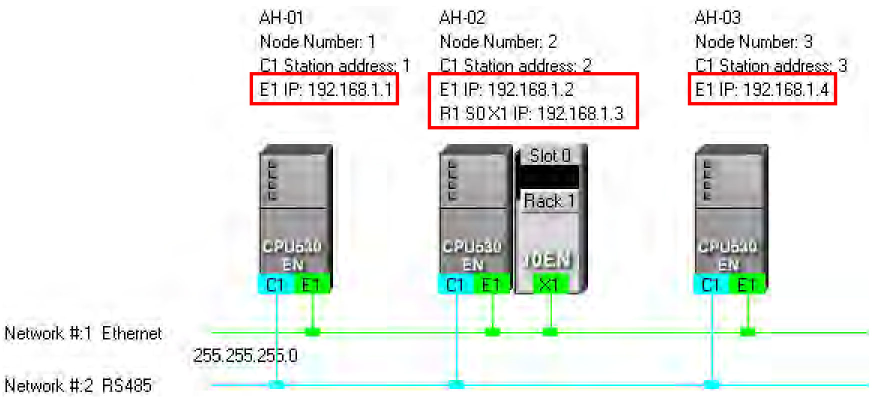


- **Multiple nodes**

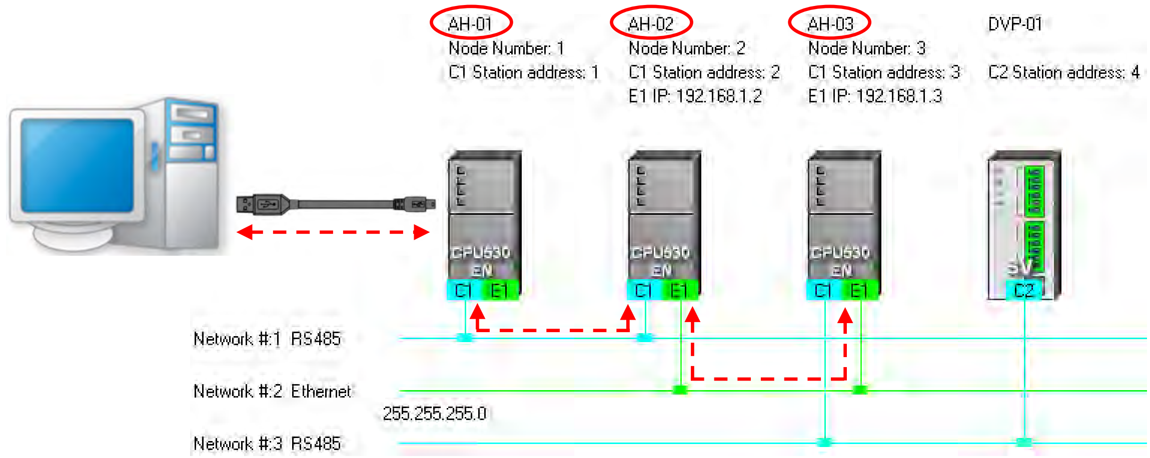
  In a network, users can download parameters to multiple devices, upload parameters from multiple devices, and monitor multiple devices. Before users download parameters to multiple devices, upload parameters from multiple devices, or monitor multiple devices, they have to make sure that the devices are connected to an Ethernet network, the devices are assigned IP addresses, and the connection type that the driver uses is Ethernet.



If the connection type that the driver selected uses is Ethernet, the system will carry out communication according to the IP addresses assigned to the devices in NWCONFIG. Before the communication is carried out, users have to make sure that the IP addresses actually assigned to the devices are the same as the IP addresses set in NWCONFIG, and the networks actually created are the same as the networks created in NWCONFIG. Otherwise, an error will occur if the communication is carried out.



NWCONFIG can also carries out communication through routing.
Routing is a function provided by AH500 series CPU modules. It directs packet forwarding. Packet forwarding is the relaying of packets from their source toward their destination through intermediate nodes. In the figure below, the device which actually connects to the computer is AH-01. If the computer wants to connect to AH-03, it can communicate with it through routing, and designates AH-01 as the first station. After the computer sends a command, the command is transmitted to AH-03 through AH-01 and AH-02.



The important points about routing are listed below.

(a) Users have to create networks in NWCONFIG, and download the routing tables produced to nodes in the networks. Please refer to section 9.2 for more information.

(b) AH500 series CPU modules support routing whereas DVP series PLCs and other devices do not support routing. Although DVP series PLCs and other devices can not function as intermediate nodes through which packets pass, they can function as destinations to which packets are transmitted.

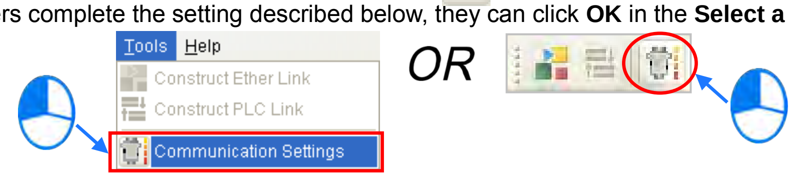
9.1.3.2 Setting Communication Parameters

The steps of setting the communication parameters in NWCONFIG are as follows. Some prerequisites have to be considered. Please refer to section 2.4 in ISPSoft User Manual for more information

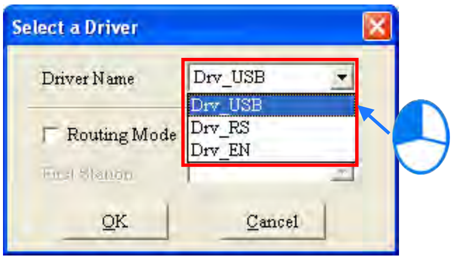
(1) Start the communication manager COMMGR, and then create a driver in COMMGR.

(2) If users want to download parameters to a single device, upload parameters from a single device, or monitor a single device, they have to make sure that the device specified is the same as the device which is actually connected to the computer. If the users want to download parameters to multiple devices, upload parameters from multiple devices, or monitor multiple devices, they have to make sure that the devices are connected to an Ethernet network, the devices are assigned IP addresses, the IP addresses actually assigned to the devices are the same as the IP addresses set in NWCONFIG, and the networks actually created are the same as the networks created in NWCONFIG.

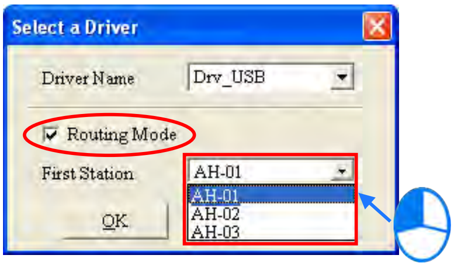
(3) Click **Communication Setting** on the **Tools** menu or  on the toolbar in the NWCONFIG window. After the users complete the setting described below, they can click **OK** in the **Select a Driver** window.



(4) Select a driver in the **Driver Name** drop-down list box. If the users want to download parameters to a single device, upload parameters from a single device, or monitor a single device, they have to select a driver which can connect to the device specified. If the users want to download parameters to multiple devices, upload parameters from multiple devices, or monitor multiple devices, the connection type that the driver selected uses must be Ethernet. The users have to make sure that the driver selected is not in the ERROR state.



(5) The users have to make sure that the routing tables produced are downloaded to nodes in the networks before they use routing. If the users want to use routing, they have to select the **Routing Mode** checkbox, and select a device in the **First Station** drop-down list box. Generally speaking, the device which actually connects to the computer is the first station. If the computer connects to several devices, or connect to devices through Ethernet, the users have to designate a device as the first station according to the network framework created in NWCONFIG. Besides, if the **Routing Mode** checkbox is selected, the driver selected in the **Driver Name** drop-down list box must be a driver which can connect to the first station.

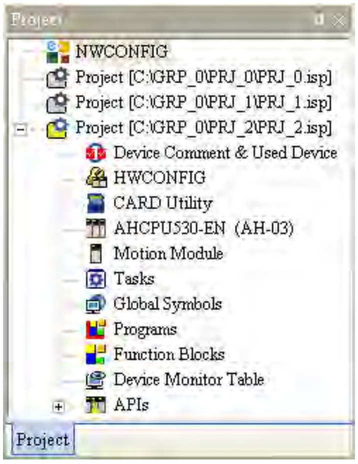


9.1.4 Workflow

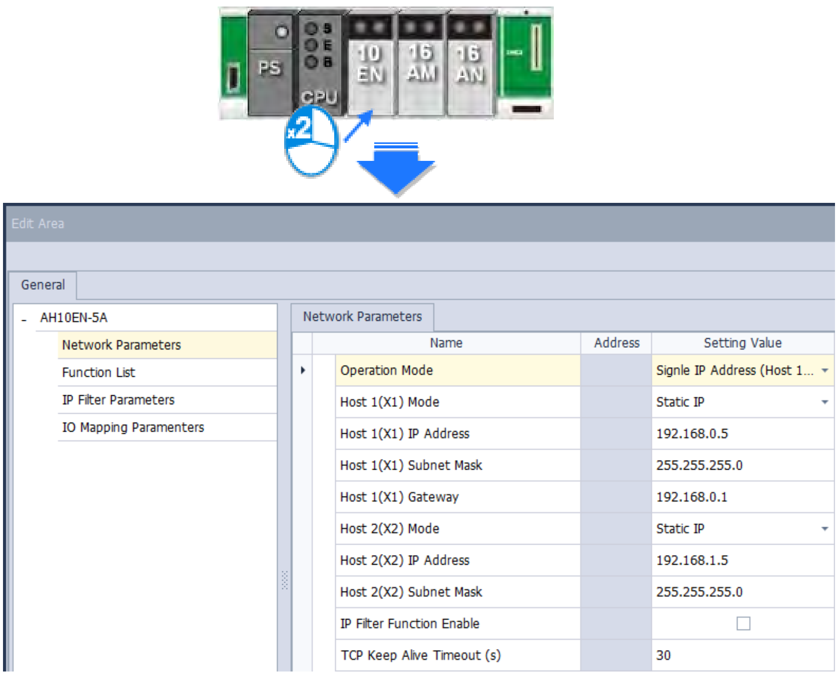
The creation of networks involves the operation of a system, and therefore the workflow needed must consist of a sequence of connected steps. The workflow needed to create networks is introduced briefly in this section, and will be described in length in the following sections. The workflow introduced in this section is a method which can be used to efficiently complete work in a general condition. It is not necessarily applicable to all conditions. Users can adjust the workflow according to the actual situations or their habits.

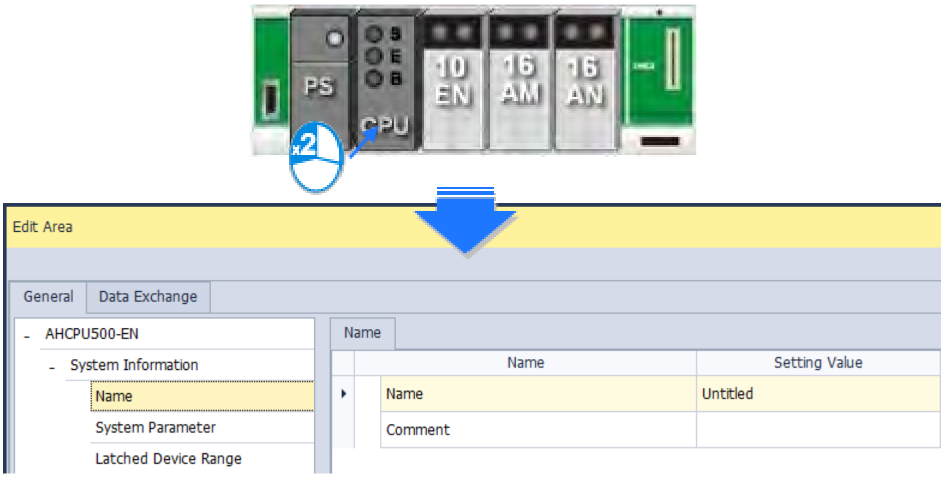
(1) Before users create a system by means of ISPSoft, they have to design networks. The users have to decide what PLCs or devices are used in the networks, whether a PLC needs to be connected to a network module, how the nodes in the networks are connected, what IP address or RS-485 station address are assigned to the ports connected, and what the values of RS-485 communication parameters are. Besides, the users have to decide what devices perform data exchange. The data exchange is related to the programs in the PLCs used in the networks. After the users design networks, they can create the networks in ISPSoft.

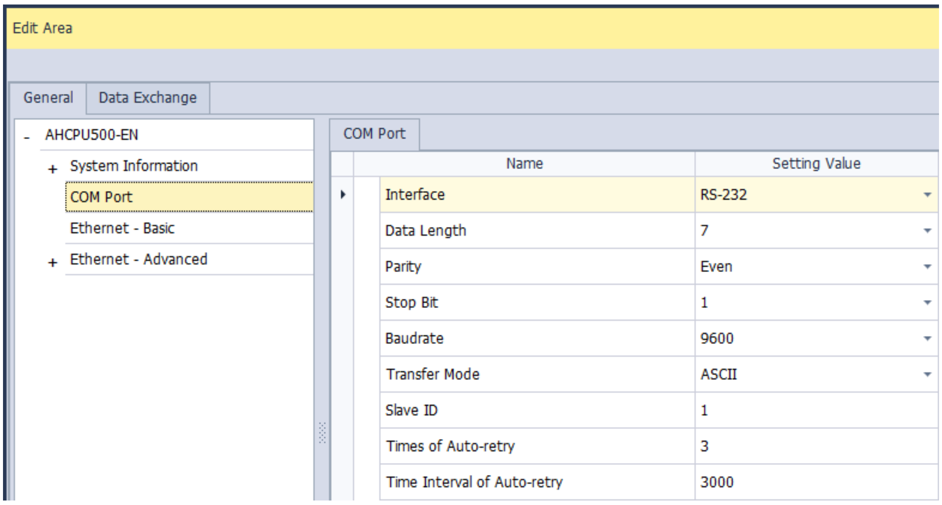
(2) Create a project in ISPSoft. If there are more than two Delta PLCs in a system, it is recommended that the users should create a group of projects in ISPSoft. Please refer to section 2.2 in ISPSoft User Manual for more information.

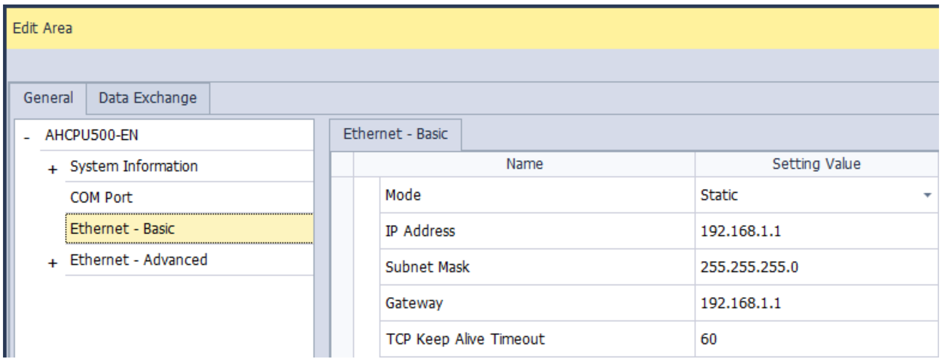


(3) If there are projects for AH500 series CPU modules, the users have to open the HWCONFIG windows in the projects, and complete hardware configurations. The users have to configure modules, set the parameters in network modules, gives names to the CPU modules, set ports, and set Ethernet ports. Please refer to chapter 8 for more information.

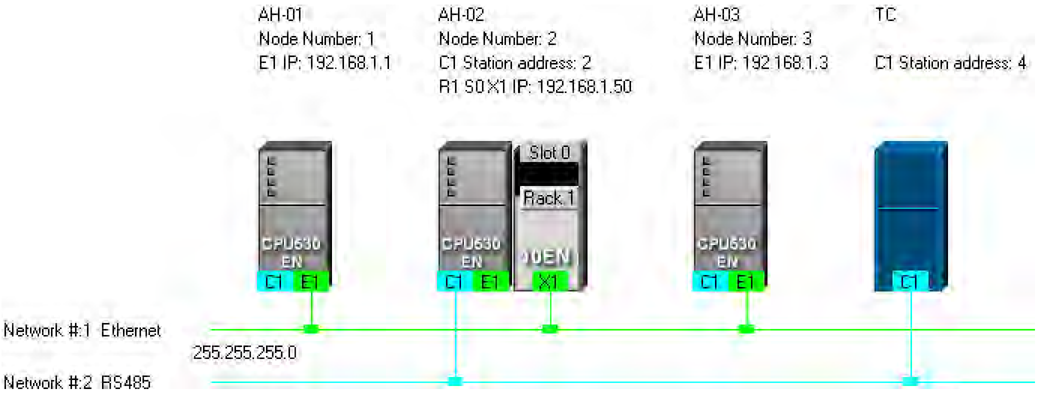



PS
CPU
10 EN
16 AM
16 AN
x2
Edit Area
General
Data Exchange
AHCPU500-EN
System Information
Name
System Parameter
Latched Device Range
Name
Name
Setting Value
Name
Untitled
Comment


Edit Area
General
Data Exchange
AHCPU500-EN
System Information
COM Port
Ethernet - Basic
Ethernet - Advanced
COM Port
Name
Setting Value
Interface
RS-232
Data Length
7
Parity
Even
Stop Bit
1
Baudrate
9600
Transfer Mode
ASCII
Slave ID
1
Times of Auto-retry
3
Time Interval of Auto-retry
3000

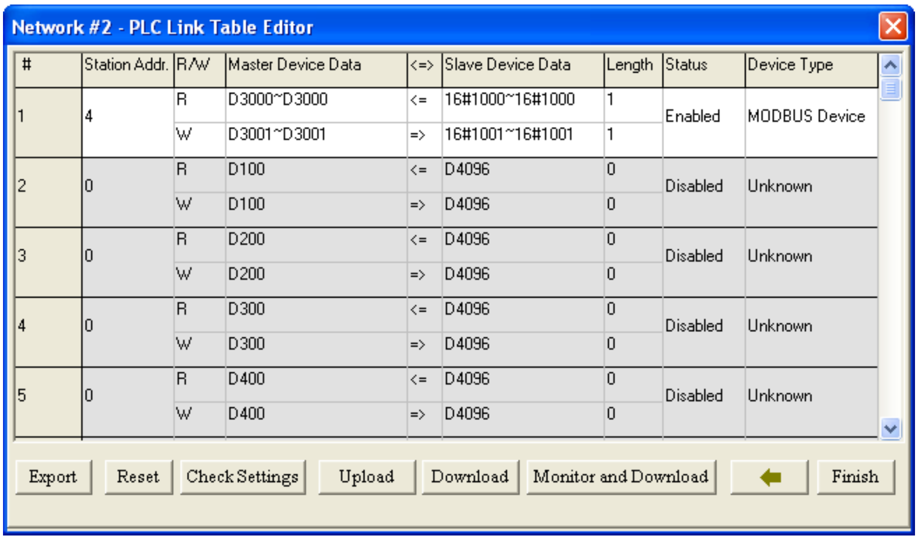

Edit Area
General
Data Exchange
AHCPU500-EN
System Information
COM Port
Ethernet - Basic
Ethernet - Advanced
Ethernet - Basic
Name
Setting Value
Mode
Static
IP Address
192.168.1.1
Subnet Mask
255.255.255.0
Gateway
192.168.1.1
TCP Keep Alive Timeout
60

(4) Complete a network configuration in NWCONFIG.



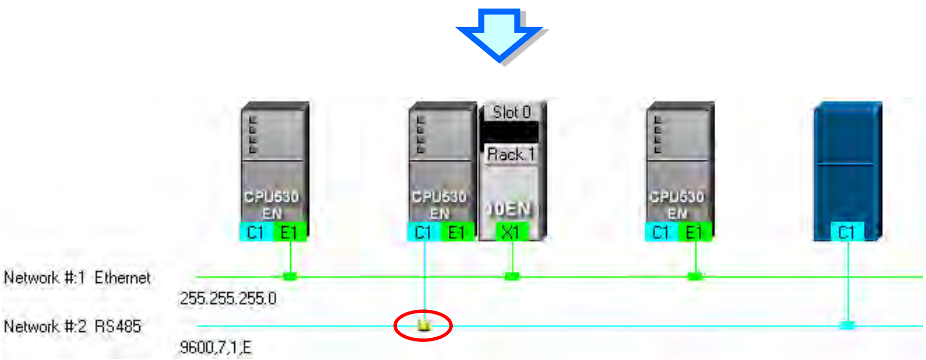
(5) Create a mechanism for data exchange performed by means of a PLC Link or an Ether Link. A PLC Link and an Ether Link operate independently. The users can create them in any order. The addresses involved in data exchange can not overlap, otherwise an error will occur after the data exchange is performed. It is recommended that the users should set addresses which are involved in data exchange according to the programs in the projects created.

The figure below is a table related to data exchange performed by means of a PLC Link. After the users complete the setting in the table, the master station in NWCONFIG will be marked.

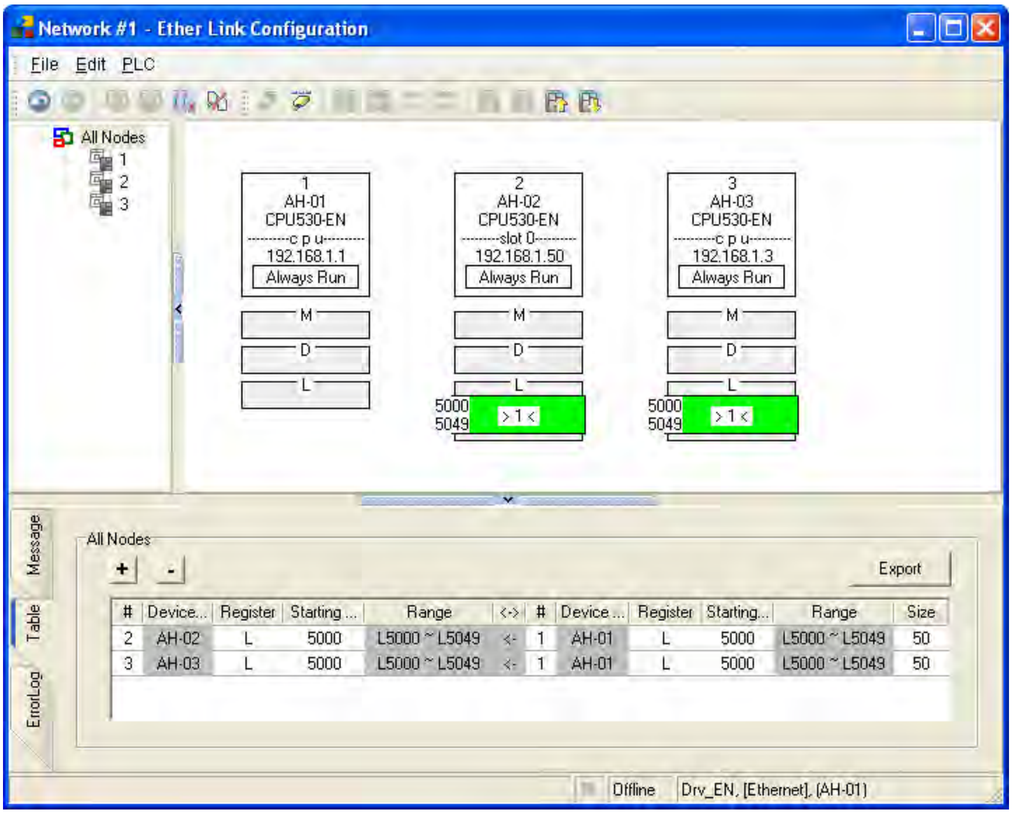

Network #2 - PLC Link Table Editor

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	4	R	D3000~D3000	<=	16#1000~16#1000	1	Enabled	MODBUS Device
		W	D3001~D3001	=>	16#1001~16#1001	1		
2	0	R	D100	<=	D4096	0	Disabled	Unknown
		W	D100	=>	D4096	0		
3	0	R	D200	<=	D4096	0	Disabled	Unknown
		W	D200	=>	D4096	0		
4	0	R	D300	<=	D4096	0	Disabled	Unknown
		W	D300	=>	D4096	0		
5	0	R	D400	<=	D4096	0	Disabled	Unknown
		W	D400	=>	D4096	0		

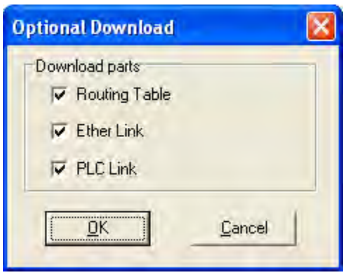
Export | Reset | Check Settings | Upload | Download | Monitor and Download | Finish



The figure below is a table related to data exchange performed by means of an Ether Link.



(6) Download the programs in the projects, the parameters set in HWCONIFG, and the parameters set in NWCONFIG to the PLCs. If the devices in the networks designed include DVP series PLCs or devices which are not AH500 series CPU modules, the users have to set the communication parameters in these DVP series PLCs or devices which are not AH500 series CPU modules.
The Optional Download window in NWCONFIG is shown below. The items which can be downloaded vary with the node selected.

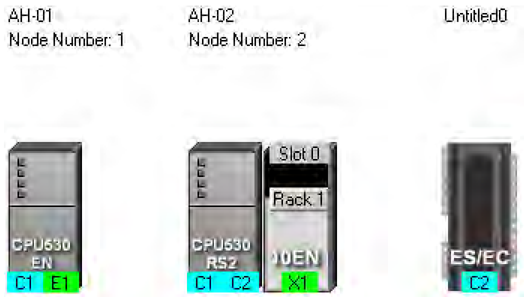


(7) Before the users start the system, they have to create actual networks according to the networks created in NWCONFIG.

9.2 Creating a Network Architecture

9.2.1 Deploying Nodes

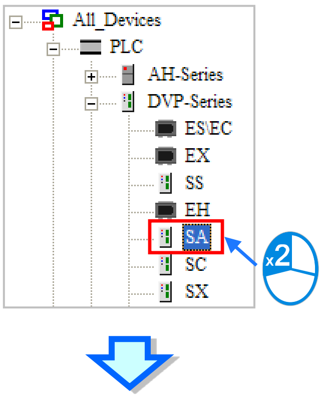
After users open the NWCONFIG window for projects for the first time, the devices for which the projects are created will be deployed in the working area in the NWCONFIG window. If the devices deployed in the working area include AH500 series CPU modules, the modules connected to the CPU modules, the parameters in the CPU modules, and the parameters in the modules connected to the CPU modules will be displayed according to the setting in HWCONFIG. The devices deployed in the working area can not be changed or deleted.

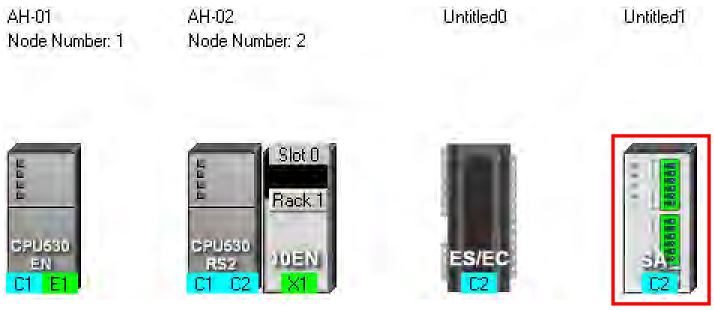


The users can add other PLCs or devices to the working area. There are two ways to add a new device to the working area.

- **Method 1**

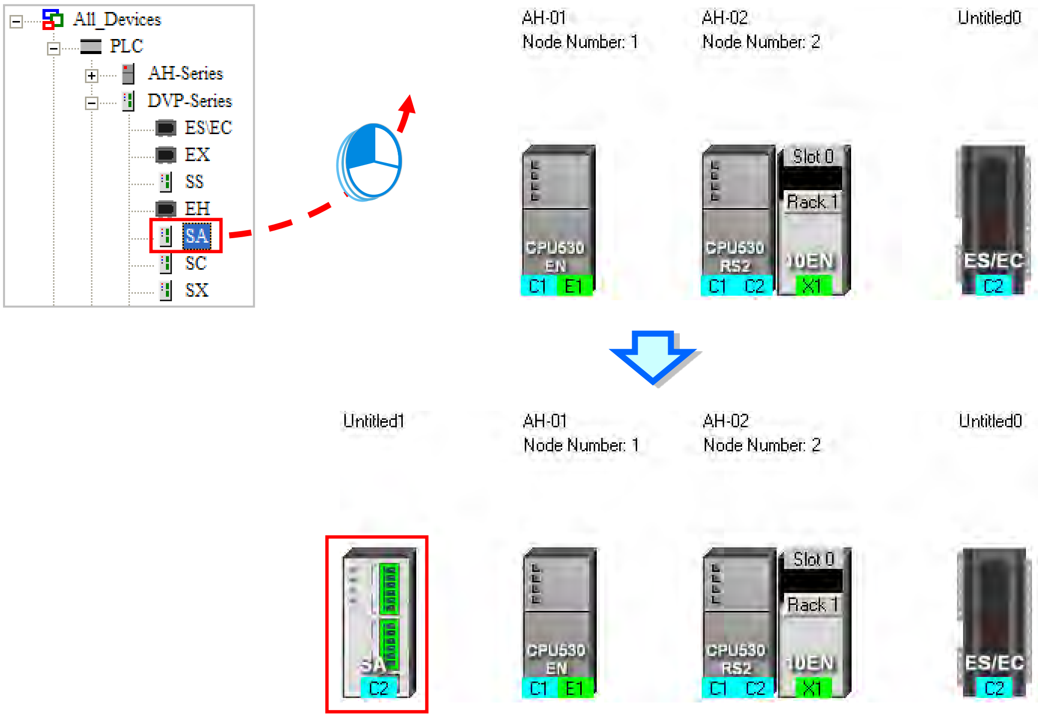
  Select a PLC or a device on the device list. After the users double-click the PLC or the device, the PLC or the device will be put at the right side of the rightmost device in the working area.



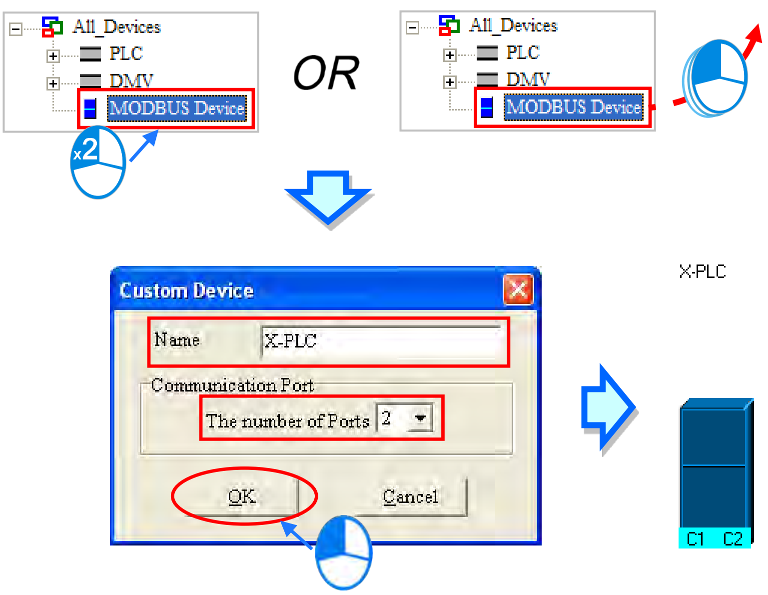


- **Method 2**

  Select a PLC or a device on the device list, and then drag it to a position in the working area.



The users can add a user-defined Modbus device to the working area. After the users select **MODBUS Device** on the device list, and add it to the working area in one of the two ways described above, the **Custom Device** window will appear. The users have to type a name in the **Name** box, select a number in the **The number of ports** drop-down list box, and click **OK**. (A user-defined Modbus device can have three ports at most.)

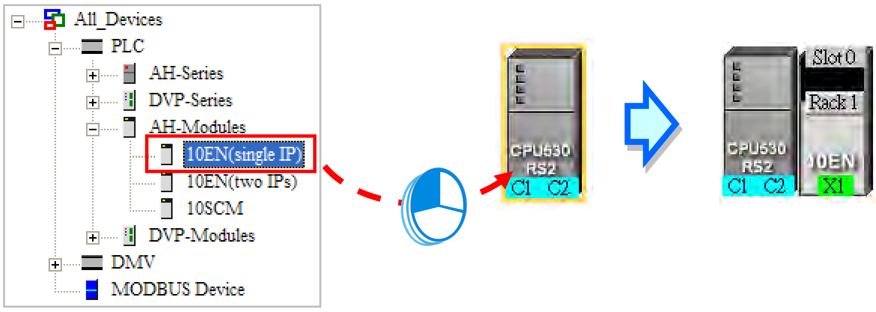


The users can add network modules to the working area. However, if the devices deployed in the working area include AH500 series CPU modules for which projects are created, the users can not connect network modules to the CPU modules. If the users want to connect network modules to the CPU modules, they have to close the NWCONFIG window, configure the network modules in HWCONFIG, and save the setting in HWCONFIG. After the users open the NWCONFIG window again, the system will update the network configuration in NWCONFIG. Besides, the users can directly connect network modules to the DVP series PLCs in the NWCONFIG window.

There are two ways to add a network module to the working area.

- **Method 1**

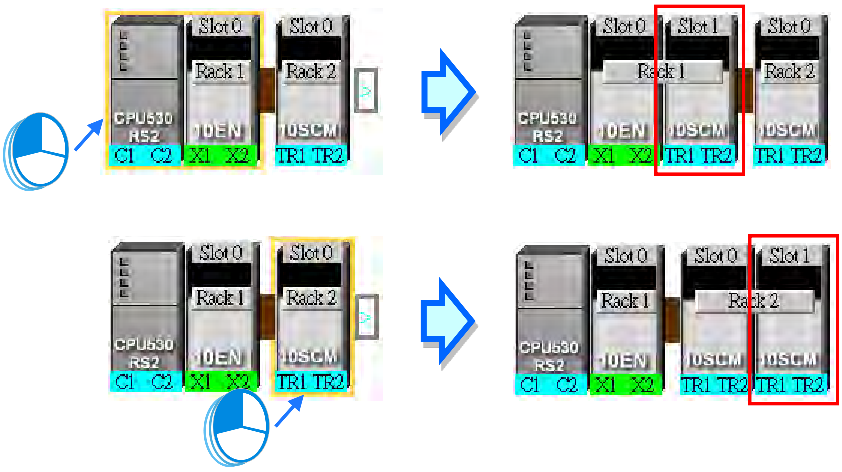
  Select a network module on the device list, and then drag it to a PLC in the working area.



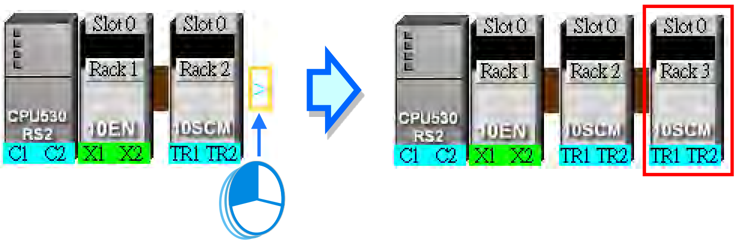
If the PLC does not support the network module selected, the mouse cursor becomes .

An AH10EN series module can only be put on a main backplane. Eight AH10EN series modules at most can be put on a main backplane. An AH10SCM series module can be put on an extension backplane. The number of AH10SCM series modules which can be put on a backplane depends on the number of slots on the backplane.

Users can choose a backplane to which an AH10SCM series module is dragged.

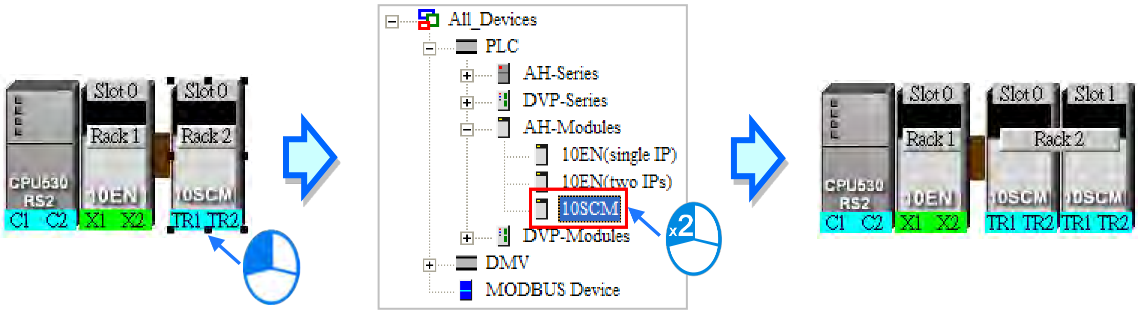


After the users drag an AH10SCM series module to at the right side of a node, an extension rack will be added to the node.

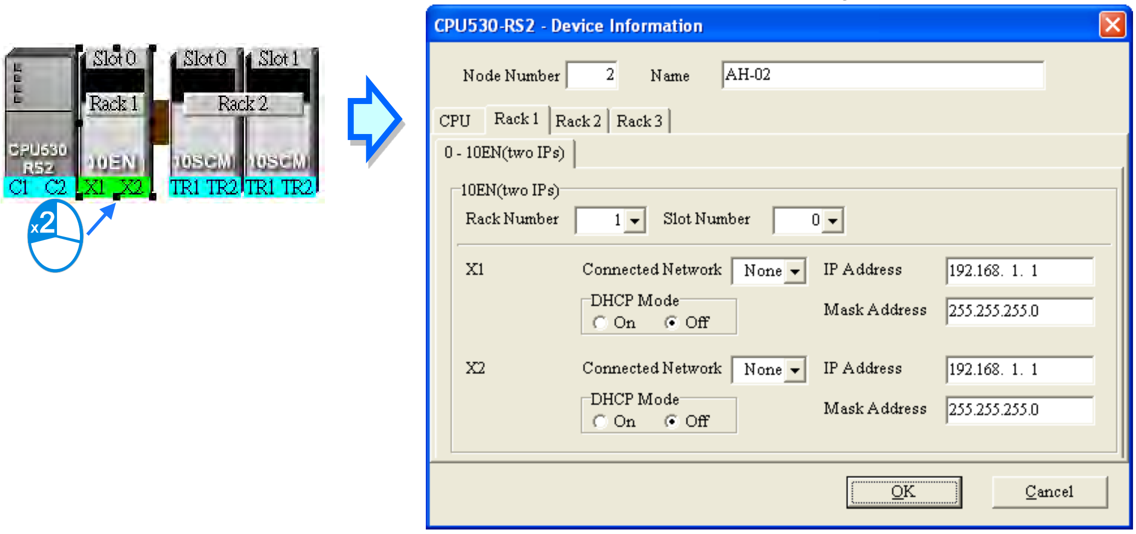


- **Method 2**

  Select a PLC or a rack in the working area, and then double-click a network module on the device list.



After the users add a network module to a node, the slot in which the network module is installed, and the backplane on which the network module is installed may be different from the actual slot in which the network module is installed, and the actual backplane on which the network module is installed. The users have to adjust the properties of the node. Please refer to section 9.2.4 for more information about setting properties of a node, and section 9.2.2 for more information about the marking of a port in NWCONFIG.



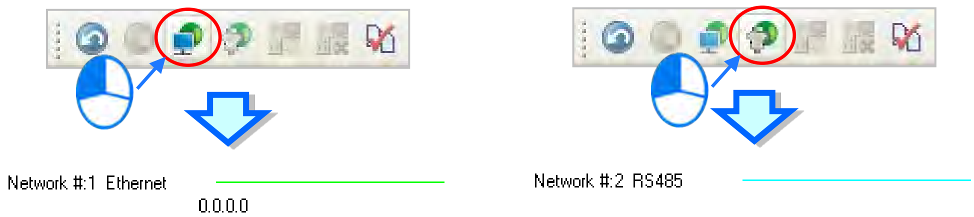
9.2.2 Connecting to a Network

After users deploy the nodes in the NWCONFIG window, they can connect the nodes to the networks designed.

There are three ways to add a network to the working area. There are Ethernet networks and RS-485 networks.

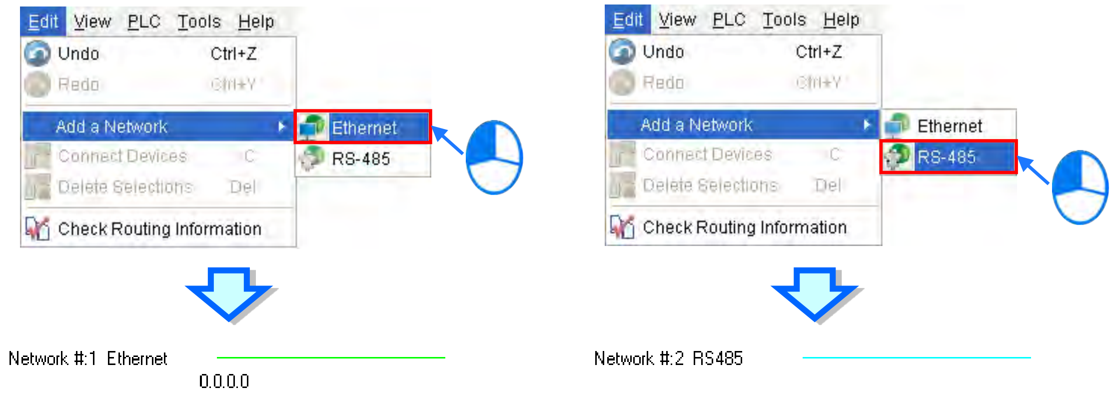
- **Method 1**

  After users click [icon] on the toolbar, an Ethernet network is added. After the users click [icon] on the toolbar, an RS-485 network is added.



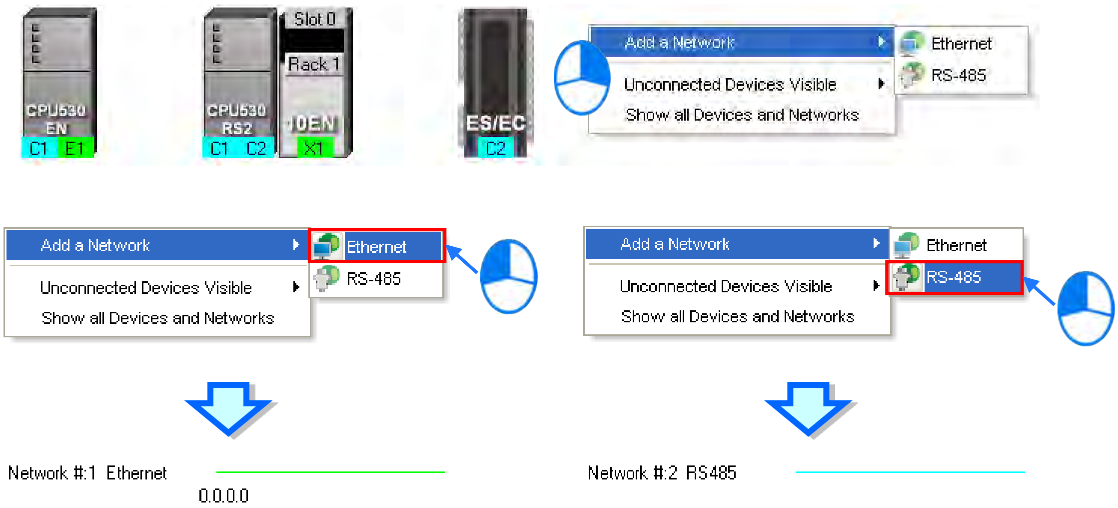
- **Method 2**

  Click the **Edit** menu, point to **Add a Network**, and click **Ethernet** or **RS-485**.



- **Method 3**

  Right-click the blank in the working area, point to **Add a Network** on the context menu, and click **Ethernet** or **RS-485**.

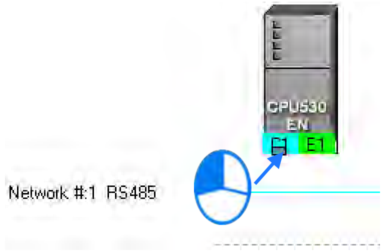


The ports of a device are displayed at the bottom of the device. If a port is blue, it is an RS-485 port. If a port is green, it is an Ethernet port. The port number assigned to a port of a device is consistent with the definition of the port. For example, E1 represents the first Ethernet port, C1 represents COM1, and C2 represents COM2. The ports of an AH10SCM series module are marked with TR1 and TR2, and the ports of an AH10EN series module are marked with X1 and X2. Besides, if the IP address assigned to an Ethernet port is a dynamic IP address, or a port of an AH10SCM series module is not a Modbus port, the Ethernet port or the port of the AH10SCN series module will be gray, and can not connect to any network.

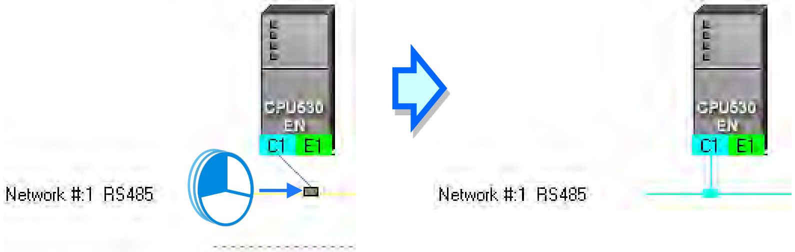
There are several ways to connect the nodes in the working area to networks.

- **Connecting a port to a network by means of dragging the port**

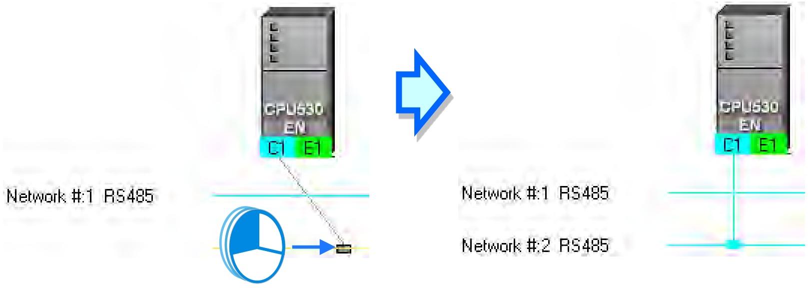
  The users press the left mouse button while the mouse cursor hovers over a port. A dotted line is under the existing network.



The users move the mouse cursor to the existing network while holding the left mouse button down. If the network matches the port, the port will connect to the network after the users release the left mouse button.



If the users move the mouse cursor to the dotted line while holding the left mouse button down, the port will connect to a network which matches the port.



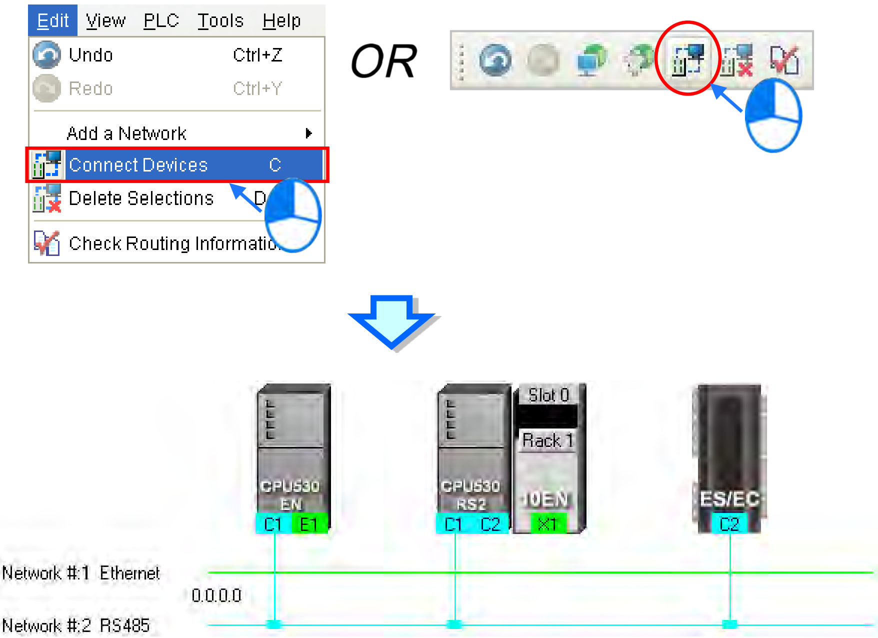
- **Connecting a single device or several devices to an existing network**

  (1) The users hold down Shift on the keyboard while they click devices and a network. They have to conform to the two principles below.

  (a) PLCs and modules are independent devices. A device that the users click must have at least one port which is not connected to any network, and matches the network clicked.

  (b) The users can click several devices, but they can only click one network.

(2) After the users click **Connect Devices** on the **Edit** menu, or  on the toolbar, the system will connect the devices clicked to the network clicked.



Additional remark

(a) If the objects selected do not conform to the two principles listed above, the system will not connect the devices selected to the network selected, and a warning message will appear.

(b) If a device selected has more than one port which is not connected to any network and matches the network selected, the system will connect the port whose port number is smaller to the network selected.

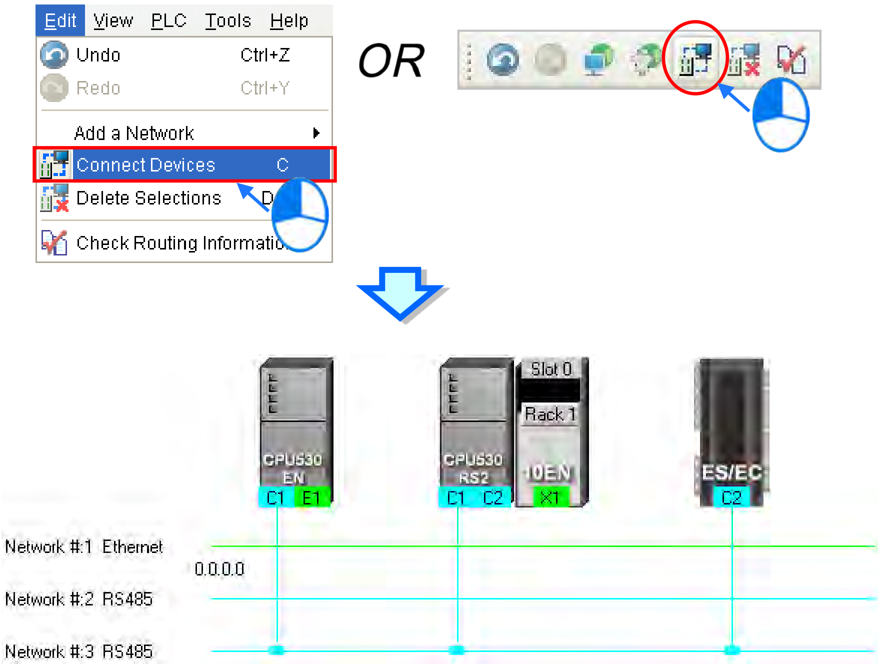
(c) Users can select multiple devices by dragging a selection net around them. If the users press Ctrl+A on the keyboard, all the devices and networks in the working area are selected.

(d) If users select a node which consists of a PLC and a module, and the PLC and the module conform to the principles listed above, the system will connect a port of the PLC and a port of the module to the network selected.

- **Automatically connecting a single device or several devices to a new network**

  (1) The users hold down Shift on the keyboard while they click devices. PLCs and modules are independent devices. A device that the users click must have at least one port which is not connected to any network, and matches the new network added.

(2) After the users click **Connect Devices** on the **Edit** menu, or on the toolbar, the system will connect the devices clicked to the new network added.



Additional remark

(a) If the devices selected do not conform to the principle described in (1), the system will not connect the devices selected to a new network, and a warning message will appear.

(b) If a device selected has more than one port which is not connected to any network and matches the new network added, the system will connect the port whose port number is smaller to the new network added.

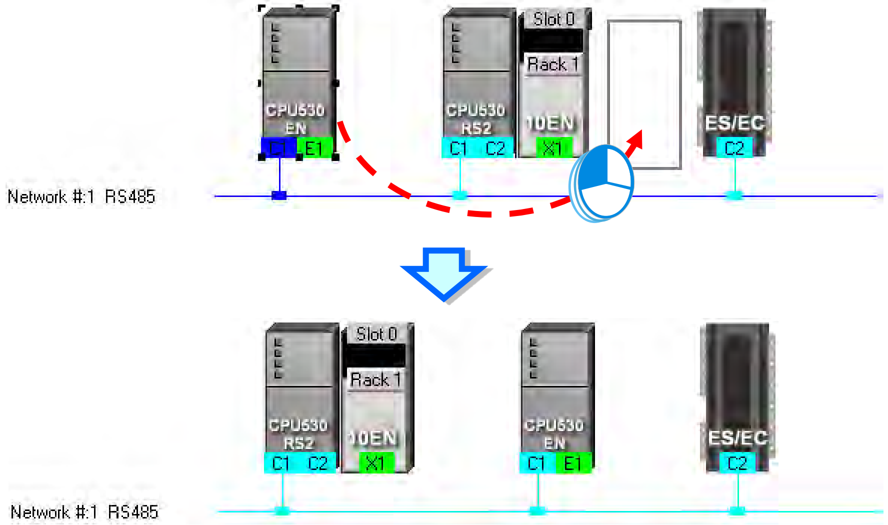
(c) Users can select multiple devices by dragging a selection net around them. If the users press Ctrl+A on the keyboard, all the devices and networks in the working area are selected.

(d) If users select a node which consists of a PLC and a module, and the PLC and the module conform to the principle described in (1), the system will connect a port of the PLC and a port of the module to a new network added.

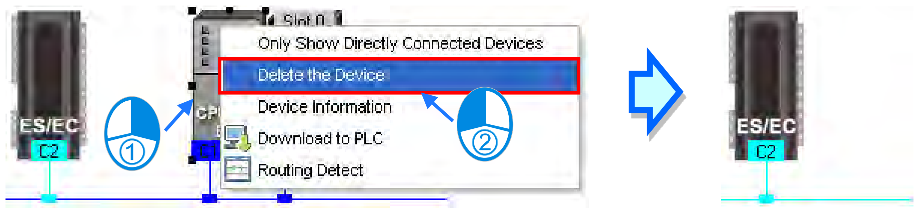
(e) If the devices that users select have ports which are not connected to any networks, and can be connected to an RS-485 network or an Ethernet network, the system will connect the ports to an Ethernet network.

9.2.3 Adjusting or Deleting Devices or Networks

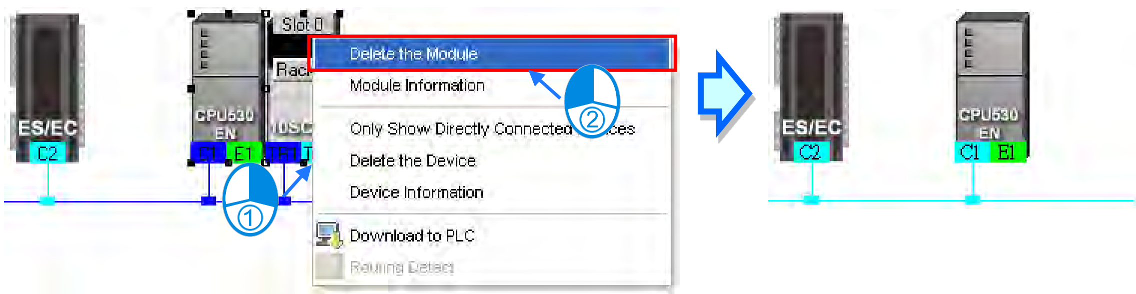
- **Adjusting the order in which the nodes in the working area are arranged**
  Users can change the order in which the nodes in the working area are arranged by dragging a node to a different position. The nodes in the working area can only be at the same level, and increase rightwards. The users can not drag a node to a position above or under another node.



- **Deleting a single device by means of a context menu**
  After users right-click a PLC, and click **Delete the Device** on the context menu, the PLC and the modules connected to the PLC will be deleted. However, the PLC for which a project is created and the modules connected to the PLC can not be deleted.

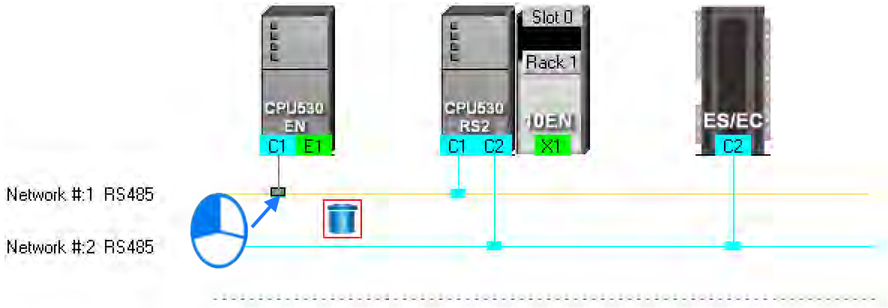


After the users right-click a module, and click **Delete the Module** on the context menu, the module will be deleted.

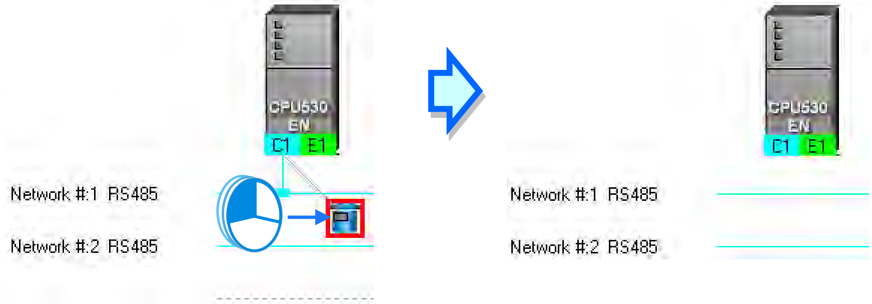


- **Adjusting a connection**

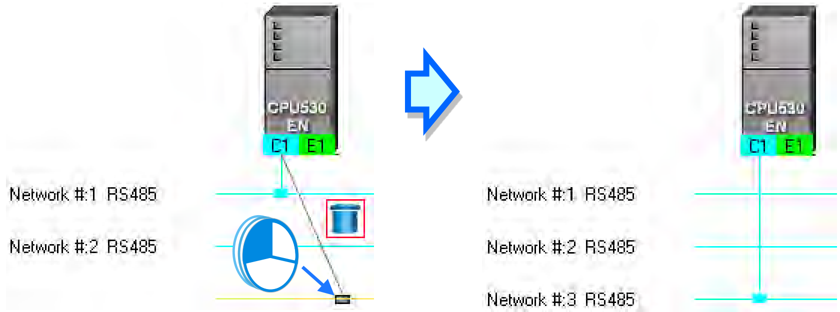
If users press the left mouse button while the mouse cursor hovers over a connection point which connects a network and a port, a small picture representing a trash can and a dotted line will appear.



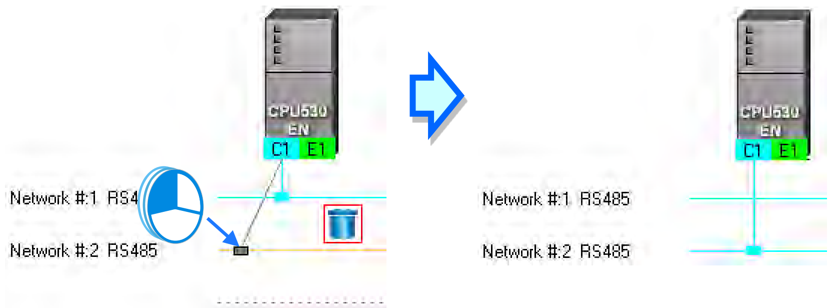
If the users release the left mouse button after they drag the connection point to the small picture representing a trash, the connection between the network and the port will be canceled.



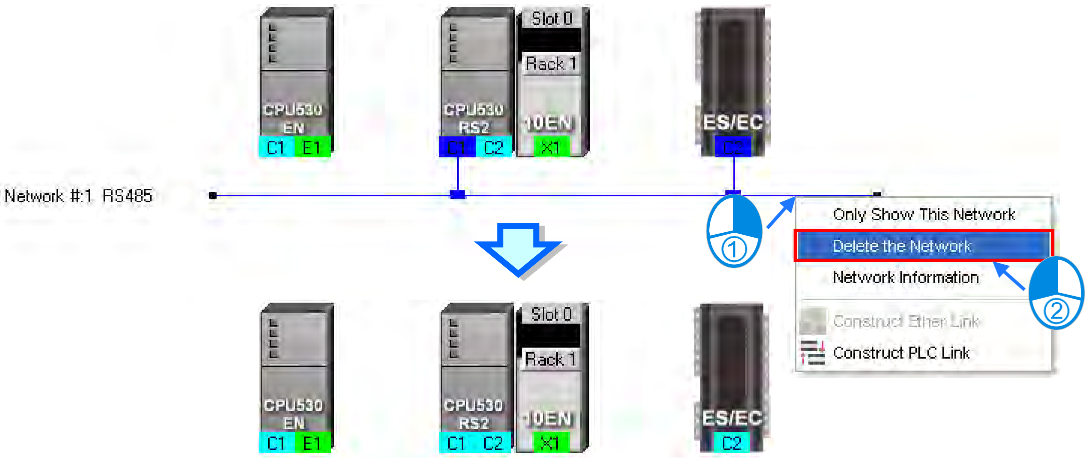
If the users drag the connection point to the dotted line, the system will connect the port to the new network added.



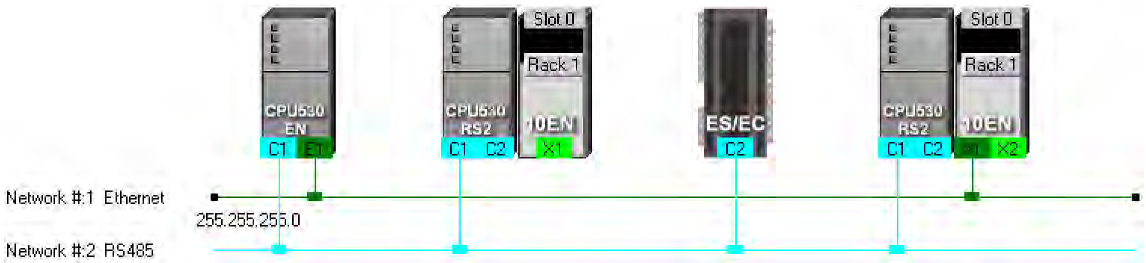
If the users release the left mouse button after they drag the connection point to another network which matches the port, the port will be connected to the network.



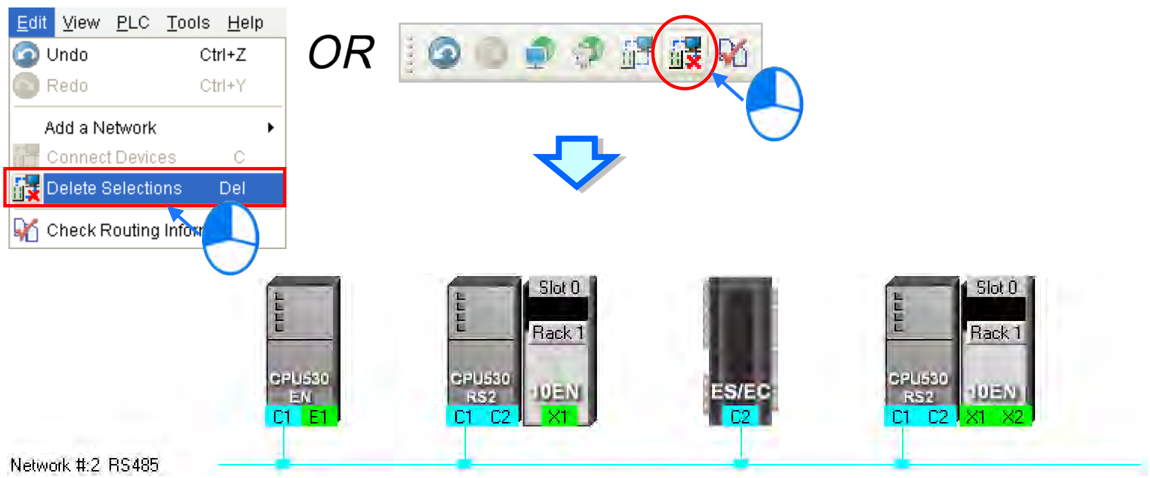
- **Deleting a single network by means of a context menu**
  After users right-click a network, and click **Delete the Network** on the context menu, the network and the lines connected to the network will disappear.



- **Deleting several devices or several networks**
  Users can select several objects by holding down Shift on the keyboard. Besides, the users can select multiple devices by dragging a selection net around them, or selecting all the objects in the working area by pressing Ctrl+A on the keyboard.

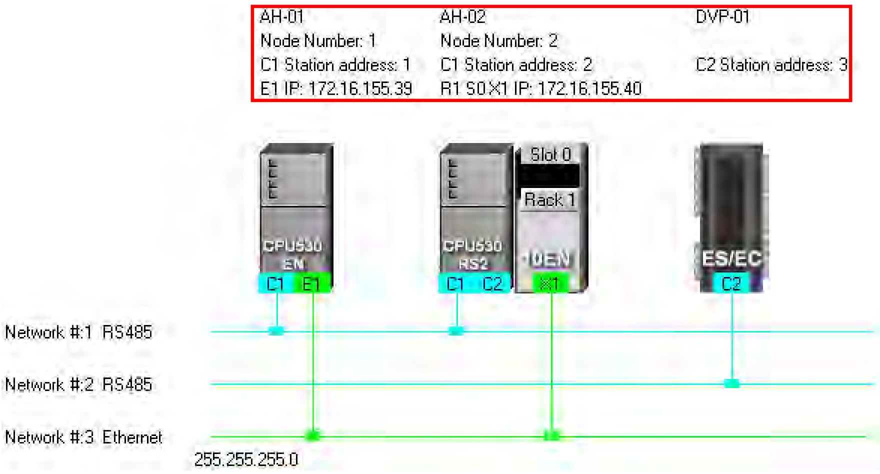


After the users click **Delete Selections** on the **Edit** menu, click on the toolbar, or press Delete on the keyboard, the objects selected will be deleted. However, the PLC for which a project is created and the modules connected to the PLC can not be deleted. Besides, if a PLC is deleted, the modules connected to the PLC will also be deleted.

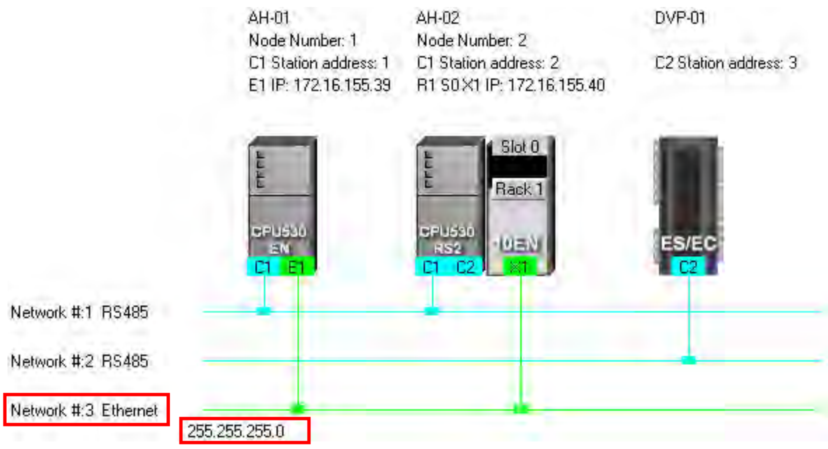


9.2.4 Setting the Attributes of a Node / Network

After users deploy the nodes in the NWCONFIG window, the information about the nodes will put above the nodes. The information includes PLC names and node numbers. The attributes of the ports connected to networks are also displayed. If a port is an RS-485 port, a station address will be displayed. If a port is an Ethernet port, an IP address will be displayed. The information about a port will be shown if the port is connected to a network. If a port is not connected to any network, no information about the port will be shown. Besides, if a port of a network module is connected to a network, the information about the slot in which the network module is installed, and the information about the backplane on which the network module is installed will be shown.

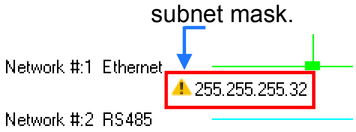


In addition to the information about the nodes, the network numbers assigned to the networks and the network types of the networks are shown. If a network is an Ethernet network, the subnet mask assigned to the ports connected to the network will be shown.

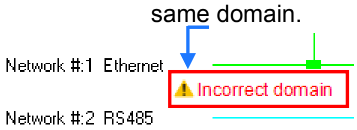


If the ports connected to an Ethernet network are not in the same domain, or are not assigned the same subnet mask, a warning sign will appear. If the ports connected to an Ethernet network are not assigned the same subnet mask, the strictest subnet mask will be shown.

The ports connected to the Ethernet network are not assigned the same subnet mask.



The ports connected to the Ethernet network are not in the same domain.

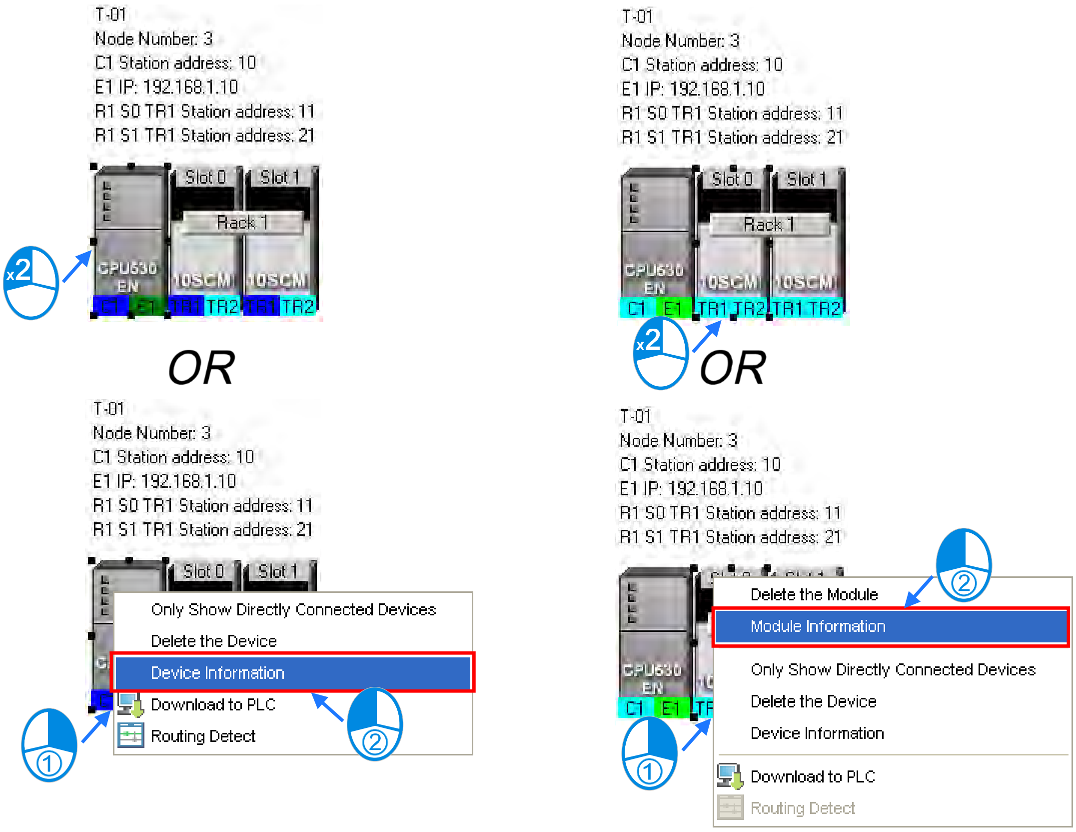


- **Setting the attributes of a node**

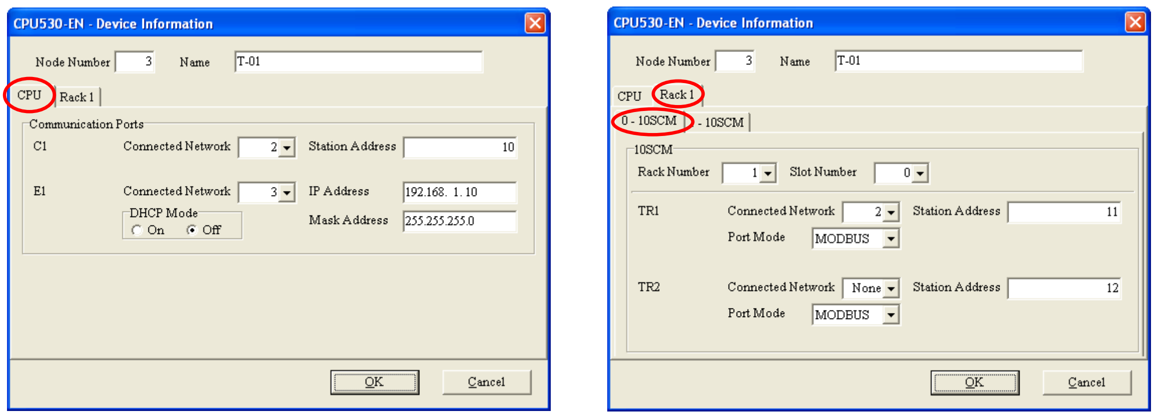
  There are two ways to open the **Device Information** window.

  (a) After users double-click a PLC, the **Device Information** window will appear. The users can also open the **Device Information** window by right-clicking the PLC, and clicking **Device Information** on the context menu.

  (b) After users double click a module, the **Device Information** window will appear. The users can also open the **Device Information** window by right-clicking the module, and clicking **Module Information** on the context menu.



In the **Device Information** window, there are two tabs. The page displayed in the window depends on the device selected.



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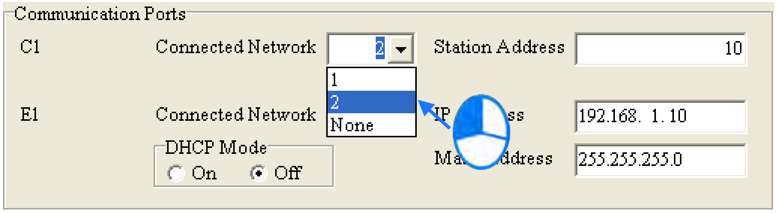
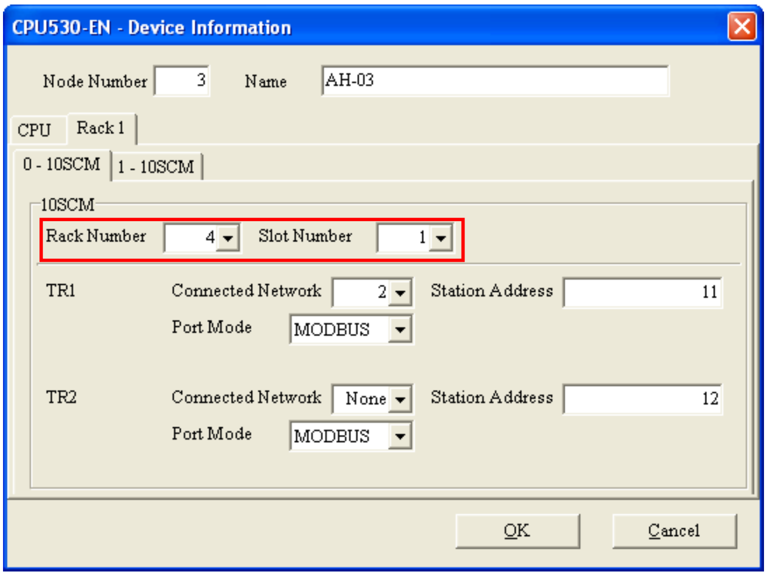
If the device selected is the AH500 series CPU module for which a project is created, or a module connected to the AH500 series CPU module for which a project is created, most boxes in the **Device Information** window are gray. The attributes of the device can only be modified by means of HWCONFIG. If the device selected is a DVP series PLC, a device which is added to the working area, the users can set the attributes of the device. Please refer to section 9.1.2 for more information about the meaning of attributes.

In the **Device Information** window, a port is related to a **Connected Network** drop-down list box. If a port can be connected to several networks, the network numbers assigned to these networks will be on the drop-down list which appears after the users click in the **Connected Network** drop-down list box related to the port. The users can select a network number on the drop-down list. If **None** is selected, the port will not connect to any network. This function is similar to the adjustment of a connection described in section 9.2.3.



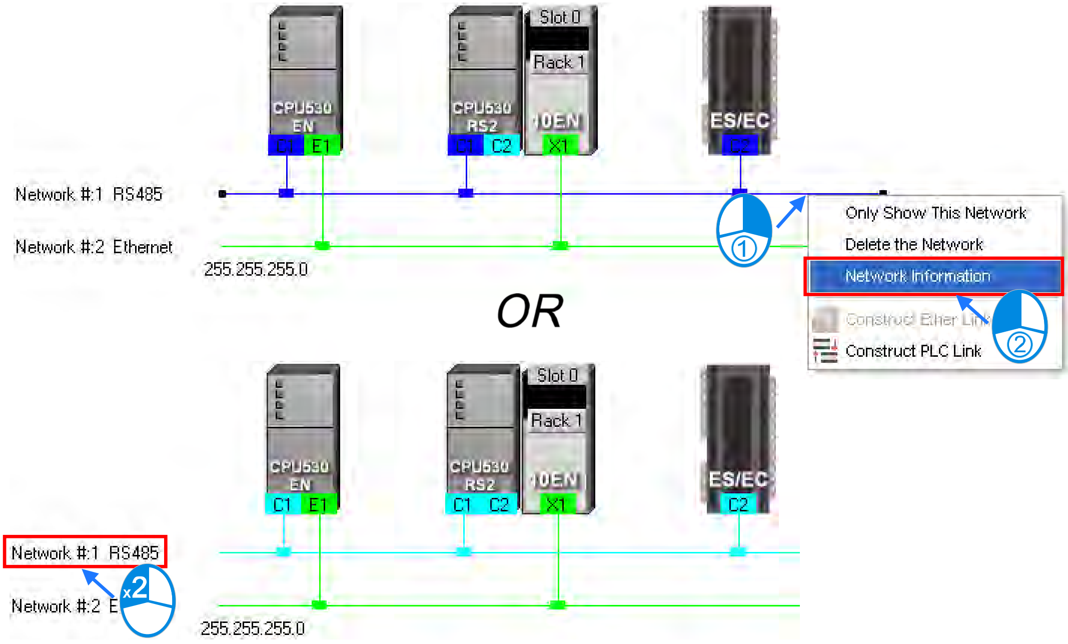
In the page for a module, the users can select a rack number in the **Rack Number** drop-down list box, and a slot number in the **Slot Number** drop-down list box.



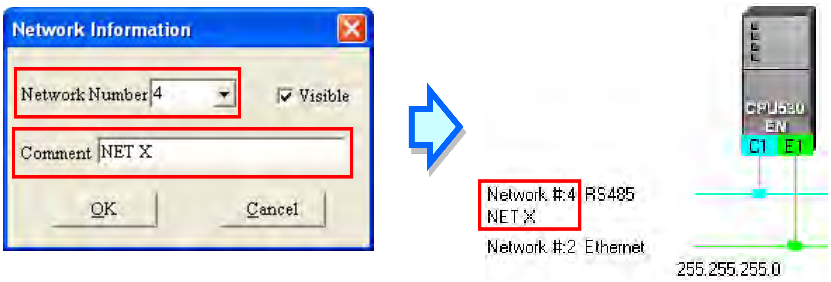
After the users complete the setting of the attributes of a node, and click **OK** in the **Device Information** window, the attributes of the node will be updated immediately.

- **Setting the attributes of a network**

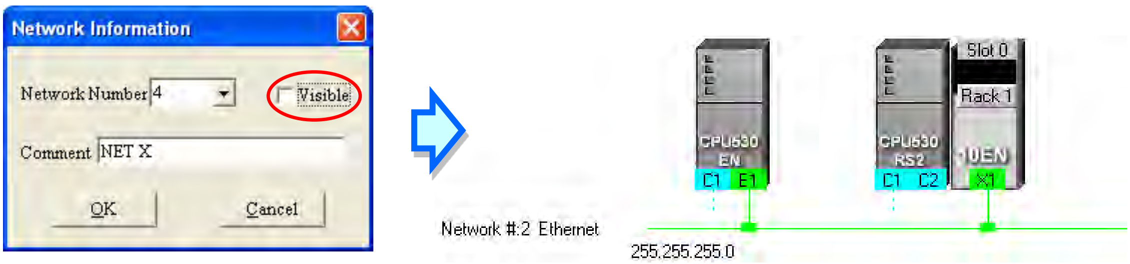
  After users double-click a network, the **Network Information** window will appear. The users can also open the **Network Information** window by right-clicking the network, and clicking **Network Information** on the context menu.



In the **Network Information** window, the users can select a network number which is not assigned to any network in the **Network Number** drop-down list box. Besides, the users can type a comment in the **Comment** box. After the users complete the setting of the attributes of the network, and click **OK** in the **Network Information** window, the attributes of the network will be updated immediately.

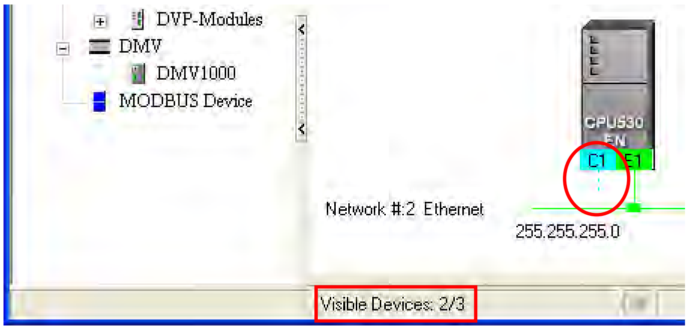


If the users unselect the **Visible** checkbox in the **Network Information** box, the network and the devices connected to the network will become invisible, the other devices connected to the other networks will still be displayed, and the lines connected to the network will become dotted lines. Please refer to section 9.2.5 for more information about hiding/displaying devices or networks.

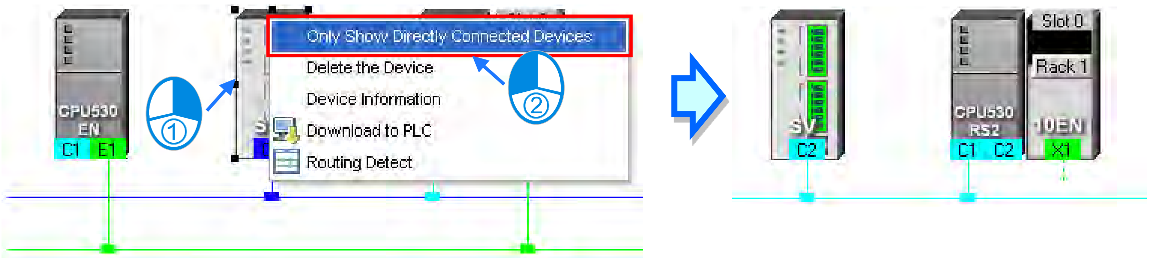


9.2.5 Hiding / Displaying Devices or Networks

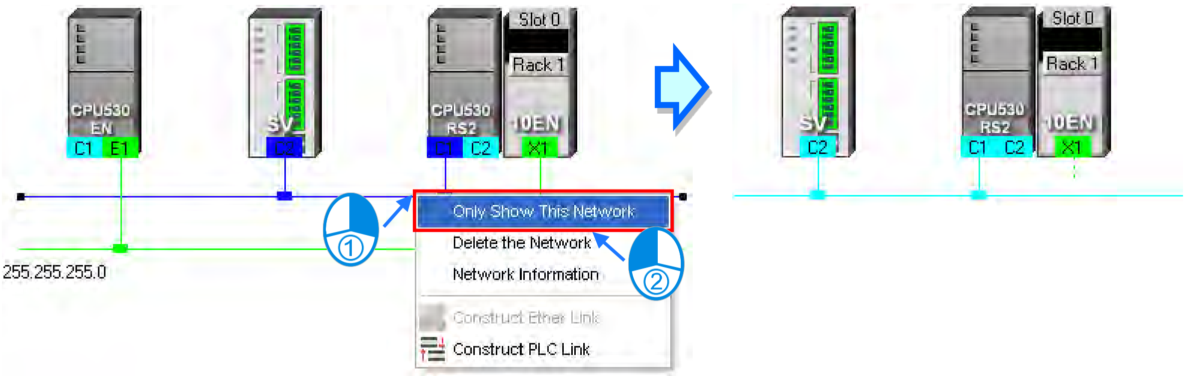
Users can hide/display devices or networks in the working area. The number of devices visible and the total number of devices are displayed in the status bar. Besides, if a dotted line is connected to a port of a device, the port is connected to an invisible network.



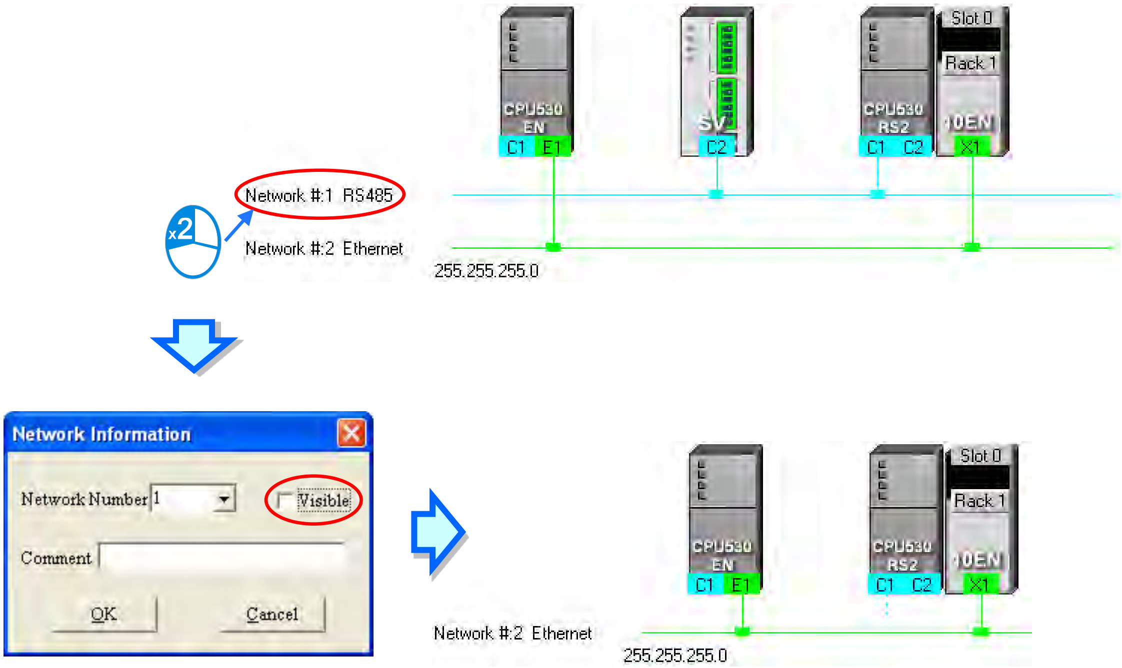
- **Only displaying the objects connected to a device**
  After users right-click a node, and click **Only Show Directly Connected Devices** on the context menu, only the network and the devices which are connected to the node will be displayed.



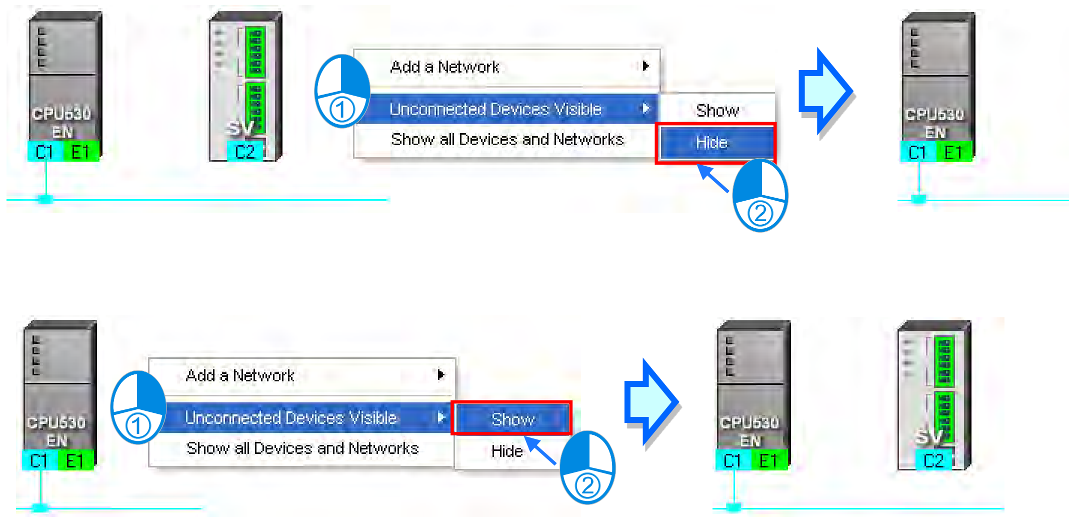
- **Only displaying the devices connected to a network**
  After users right-click a network, and click **Only Show This Network** on the context menu, only the devices connected to the network will be displayed.



- **Hiding a network and the devices connected to the network**
  After users unselect the **Visible** checkbox in the **Network Information** box, the network and the devices connected to the network will become invisible, but the other devices connected to the other networks will still be displayed,

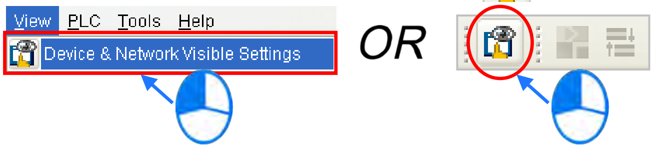


- **Hiding/Displaying the devices which are not connected to any networks**
  If users want to hide/display the devices which are not connected to any networks, they can right-click the working area, point to **Unconnected Devices Visible** on the context menu, and click **Hide**/**Show**. This operation affects the devices in the present working area. It does not affect the devices which will be added latter.

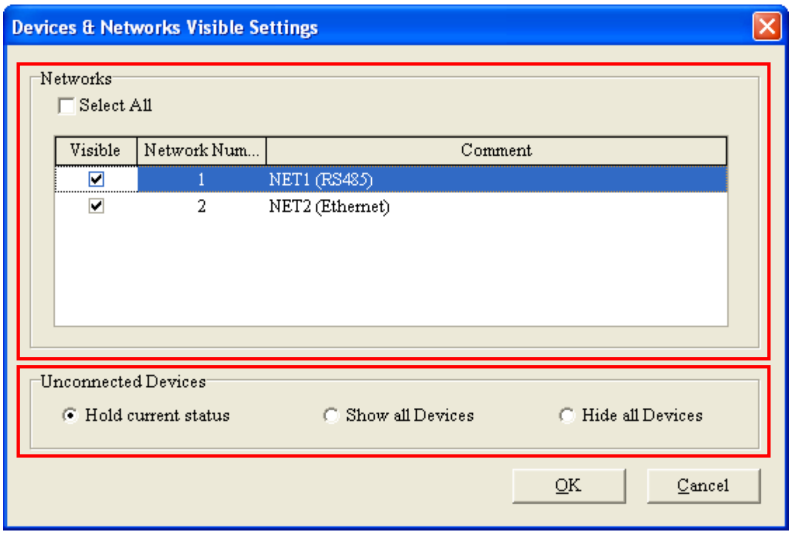


- **Setting the display states of all the objects at the same time**

  Users can set the display states of all the devices at the same time.
  Click **Device & Network Visible Settings** on the **View** Menu, or on the toolbar.

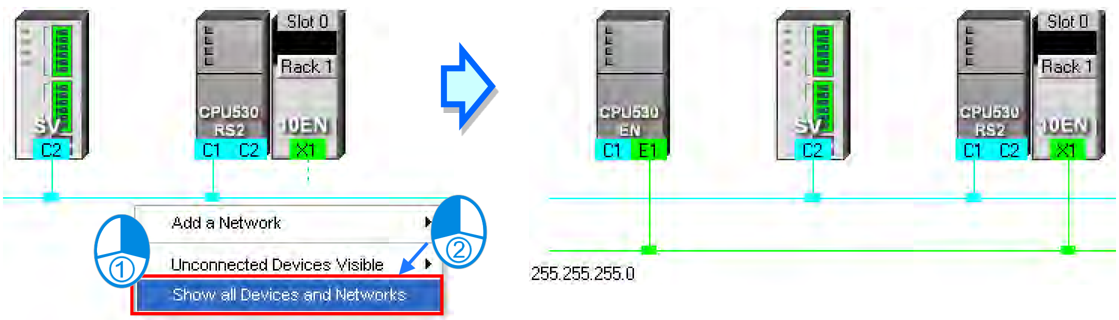


Select networks which will be displayed in the **Networks** section in the **Devices & Networks Visible Settings** window. The networks which are not selected will not be displayed in the working area. If the users select the **Select All** checkbox, all the networks in the **Networks** section will be selected. If the users unselect the **Select All** checkbox, all the networks in the **Networks** section will be unselected.
In the **Unconnected Devices** section, the users can set the display states of the devices which are not connected to any networks. This operation affects the devices in the present working area. It does not affect the devices which will be added latter.



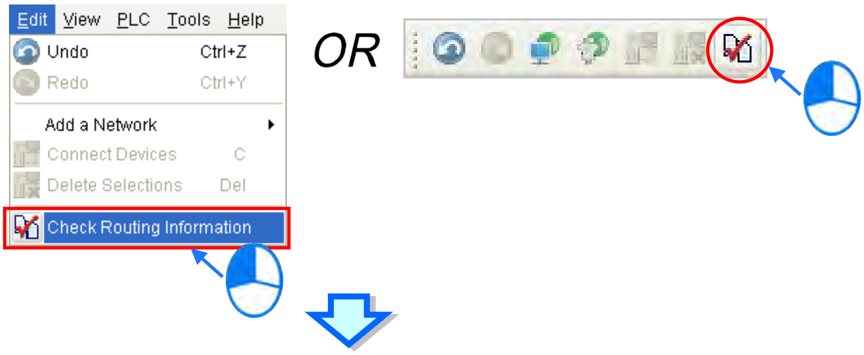
- **Displaying all the objects**

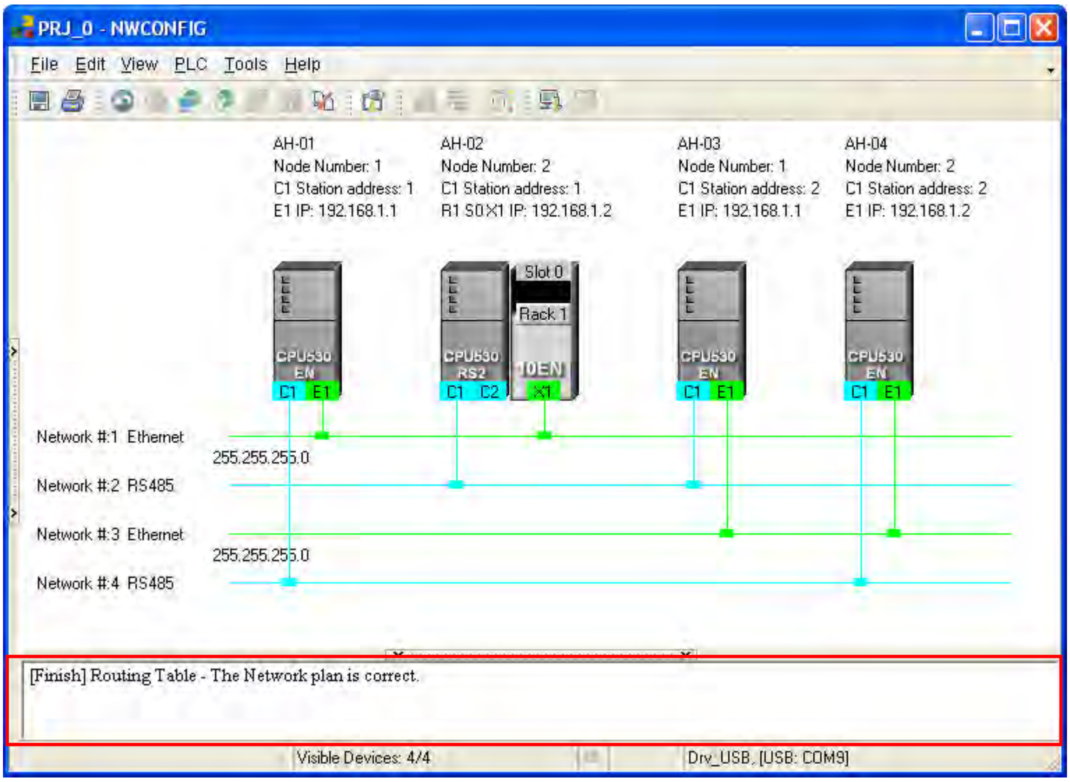
  After users right-click the blank in the working area, click **Show All Devices and Networks** on the context menu, the devices and the networks which are hidden will be displayed.



9.2.6 Correct Network Architecture

After users click **Check Routing Information** on the **Edit** menu, or  on the toolbar, the system will check whether the network architecture the users create is correct, and the check result will be displayed in the message display area.

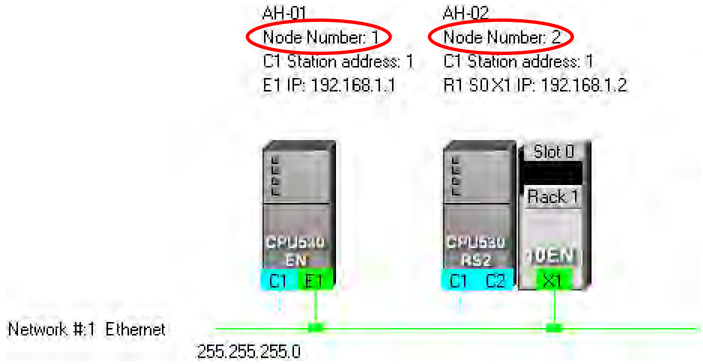


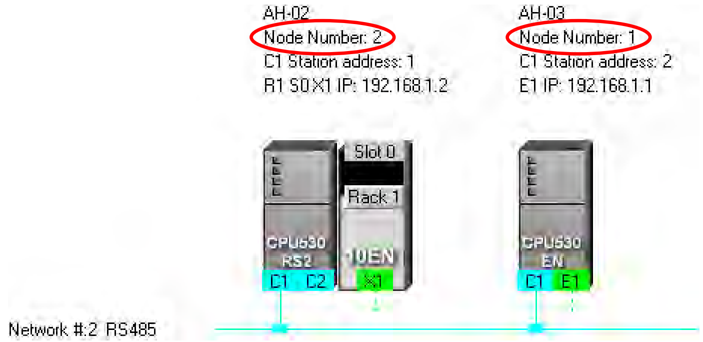


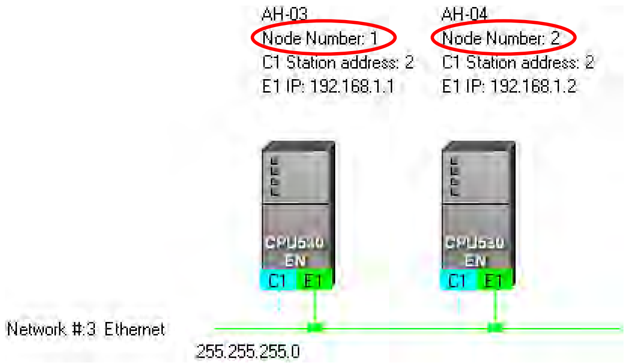
The system checks the ports which are connected to networks. It checks whether the information about the nodes and the information about the networks are correct. Specifically, it checks the node numbers, the RS-485 station addresses, and the IP addresses in the working area. At first glance, the network architecture in the figure above seems to be incorrect in that the node number assigned to AH-01 is the same as the node number assigned to AH-03, the node number assigned to AH-02 is the same as the node number assigned to AH-04, the RS-485 station address assigned to AH-01 is the same as the RS-485 station address assigned to AH-02, the RS-485 station address assigned to AH-03 is the same as the RS-485 station address assigned to AH-04, the IP address assigned to AH-01 is the same as the IP address assigned to AH-03, and the IP address assigned to AH-02 is the same as the IP address assigned to AH-04. The users can view a network at a time by means of a skill introduced in section 9.2.5. The users have to make sure that the node number, the RS-485 station address, and the IP address which are assigned to a node are not the same as the node number, the RS-485 station address, and the IP address which are assigned to another node. The message in the message display area in the figure above indicates that the network architecture in the working area is correct.

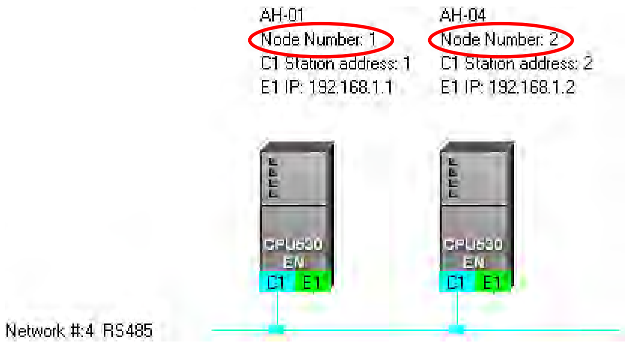
- **Node number**

  In principle, the node number assigned to a node in a network can not be the same as the node number assigned to another node in the network. If users view a network at a time, they can check whether the node number assigned to a node connected to a network is the same as the node number assigned to another node connected to the network.



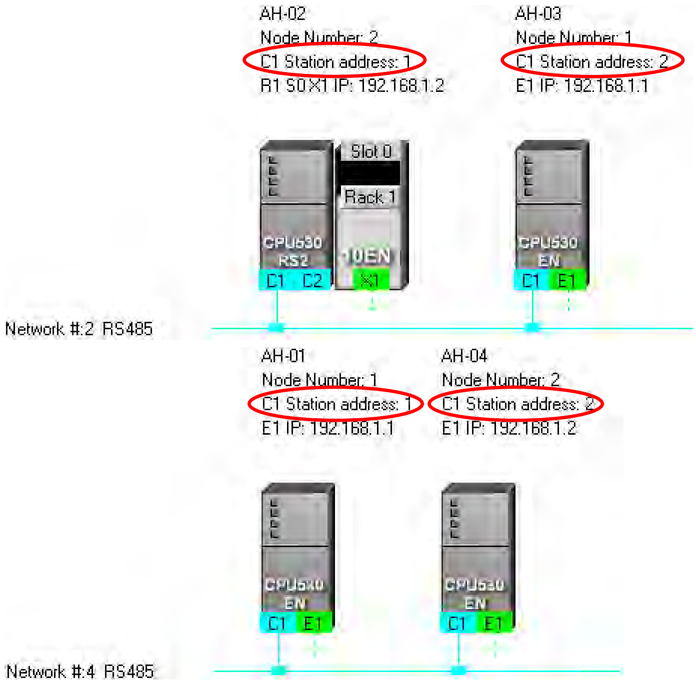






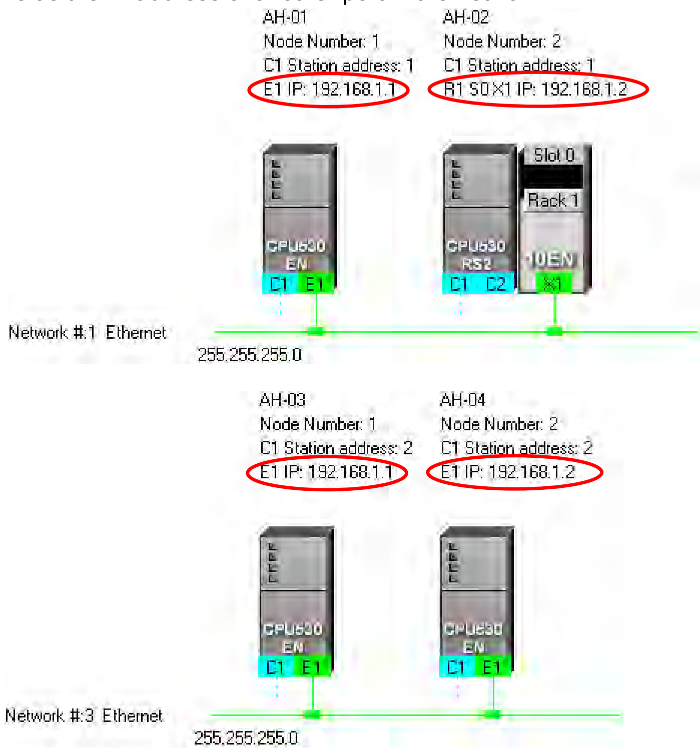
- **RS-485 station address**

  In principle, the RS-485 station address of a port in a network can not be the same as the RS-485 station address of another port in the network. If users view an RS-485 network at a time, they can check whether the RS-485 station address of a port in a network is the same as the RS-485 station address of another port in the network.



- **IP address**

  The IP address of a port in a network can not be the same as the IP address of another port in the network. If users view an Ethernet network at a time, they can check whether the IP address of a port in a network is the same as the IP address of another port in the network.



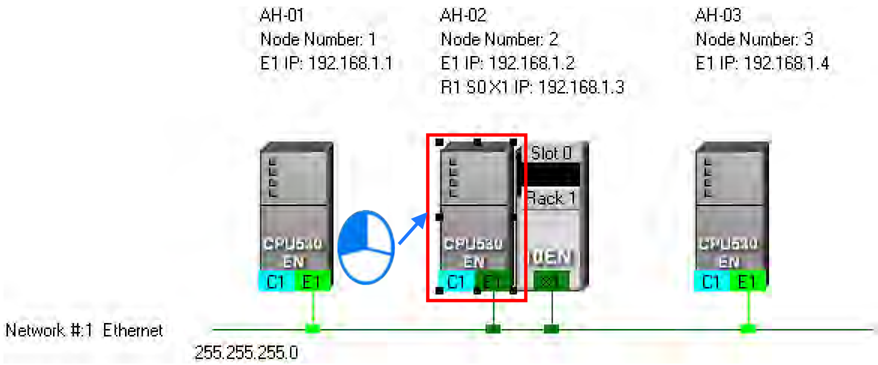
9

9.2.7 Downloading Routing Tables

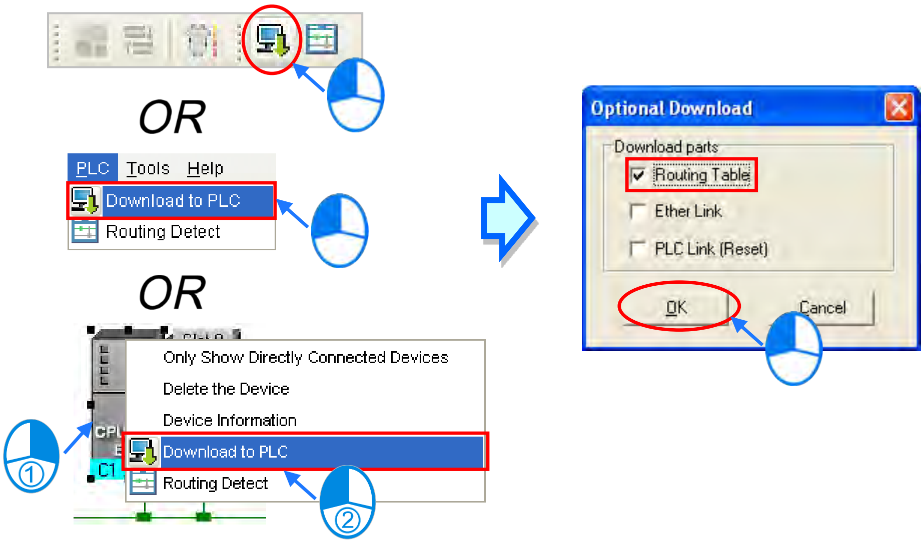
After users make sure that the network architecture they create is correct, they can download the routing tables produced to PLCs. The routing data stored in a PLC is data related to the PLC itself, and therefore the routing tables downloaded to nodes are different. The users have to download the routing tables produced to nodes in the working area.
The users can download the routing tables produced to nodes one by one, or download the routing tables produced to nodes at the same time. If the users want to download the routing tables produced to nodes, the **Routing Mode** checkbox in the **Select a Driver** window must be unselected. Please refer to section 9.1.3 for more information.

- **Single node**

  The users have to select a node in the working area. Only AH500 series CPU modules support routing. If the users select a device which is not an AH500 series CPU module, a routing table can not be downloaded to the device.

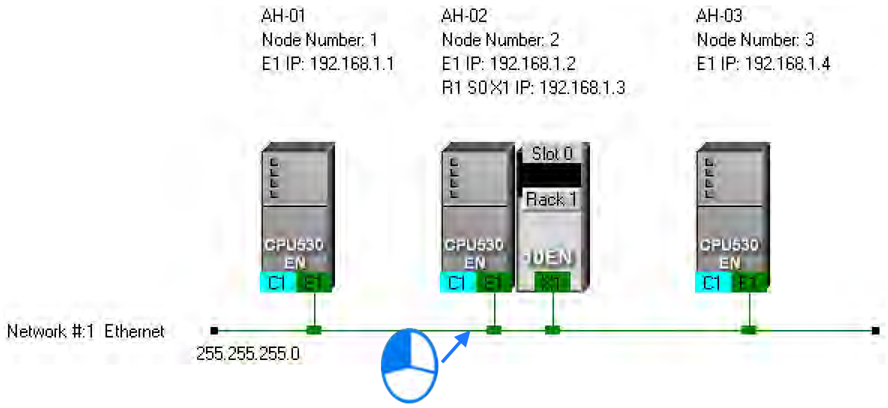


After the users click **Download to PLC** on the **PLC** menu, or  on the toolbar, the **Optional Download** window will appear. The users can also open the **Optional Download** window by right-clicking the device they select, and clicking **Download to PLC** on the context menu. After the users select the **Routing Table** checkbox in the **Optional Download** window, and click **OK**, a routing table will be downloaded to the device.

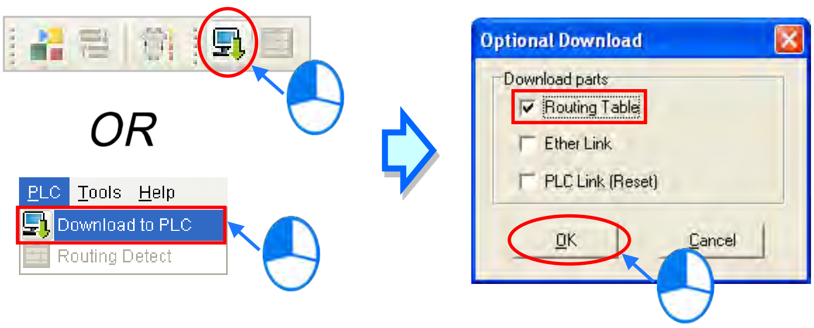


- **Multiple nodes**

  The users have to select an Ethernet network in the working area. If the actual connection is consistent with the setting in NWCONFIG, parameters can be downloaded to the nodes connected to the Ethernet network. If the users want to download the routing tables produced to multiple devices connected to the Ethernet network, the connection type that the driver selected in the **Driver Name** drop-down list box in the **Select a Driver** window uses must be Ethernet. Please refer to section 9.1.3 for more information.



After the users click **Download to PLC** on the **PLC** menu, or on the toolbar, the **Optional Download** window will appear. After the users select the **Routing Table** checkbox in the **Optional Download** window, and click **OK**, the routing tables produced will be downloaded to the nodes connected to the Ethernet network.



<u>Additional remark</u>

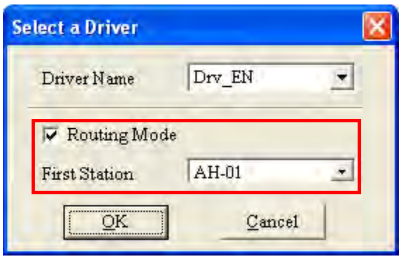
If the parameters related to an Ether Link or a PLC Link can be downloaded to the object selected, users can select the **Ether Link** checkbox or the **PLC Link (Reset)** checkbox in the **Optional Download** window. If a checkbox in the **Optional Download** window is gray, the checkbox can not be selected. Please refer to the following sections for more information about Ether Links and PLC Links.

Besides, the routing data stored in a PLC is data related to the PLC itself. The users can not upload the routing data stored in a PLC. The system does not provide the function of uploading routing data.

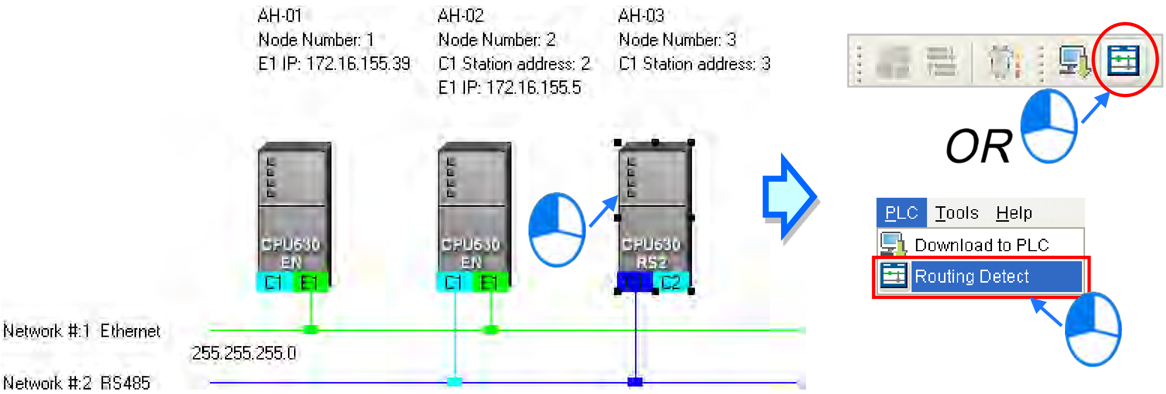
9.2.8 Testing Routing

After the routing tables produced are downloaded, users can test routing by means of a function provided by NWCONFIG. The steps of testing routing are as follows.

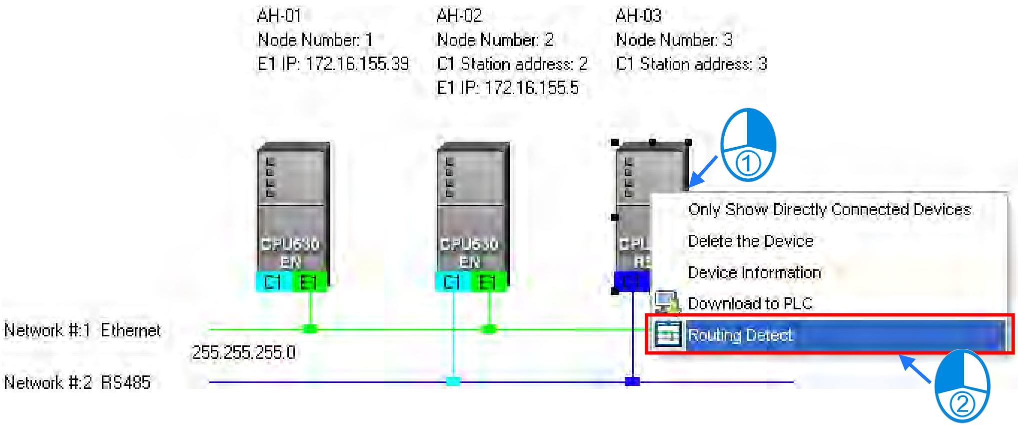
(1) The users have to make sure that all the nodes are wired according to the configuration in NWCONFIG, and operate normally. The setting of the devices has to be consistent with the setting in NWOCNIFG. In the **Select a Driver** window, the users have to select the **Routing Mode** checkbox, and select a device in the **First Station** drop-down list box. Please refer to section 9.1.3 for more information about setting communication.



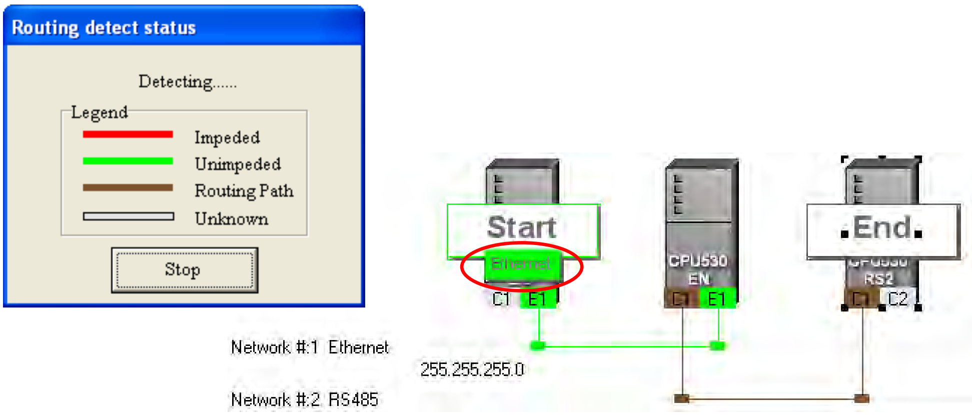
(2) After the users select the destination device toward which packets are relayed, they have to click  on the toolbar, or **Routing Detect** on the **PLC** menu.



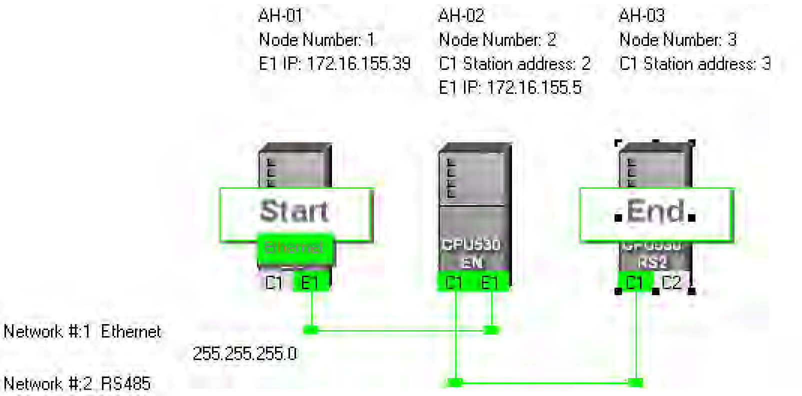
The users can also right-click the destination device, and then click **Routing Detect** on the context menu.



(3) After **Routing Detect** is clicked, the display of the network architecture in the working area will change, and the **Routing detect status** window will appear. The way in which the node which is designated as the first station is connected to the computer is also shown in the working area. Please see the red circle in the figure below.



(4) After the detection is complete, the detection result will be shown in the working area.



Additional remark

If the detection fails, the users have to make sure of the following points.

(a) The users have to make sure that the IP addresses and the station addresses which are assigned to the devices and the communication setting in the devices are consistent with the setting in NWCONFIG. If AH500 series CPU modules or AH500 series modules are used, the users have to make sure that the parameters in the AH500 series CPU modules in HWCONFIG or the parameters in the AH500 series modules in HWCONFIG are set correctly, and downloaded to the AH500 series CPU modules or the AH500 series modules successfully. If DVP series PLCs or DVP series modules are used, the users have to make sure that the communication parameters in the related registers are correct. If other devices are used, the users have to refer to manuals for the usage of these devices, and make sure that the communication parameters in these devices are correct.

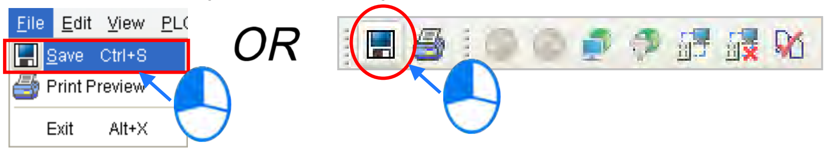
(b) The users have to make sure that all the network connection is consistent with the setting in NWCONFIG. They also have to make sure that every node is connected to a network correctly, and operates normally.

(c) Please refer to section 9.1.3, and make sure that the communication setting is correct.

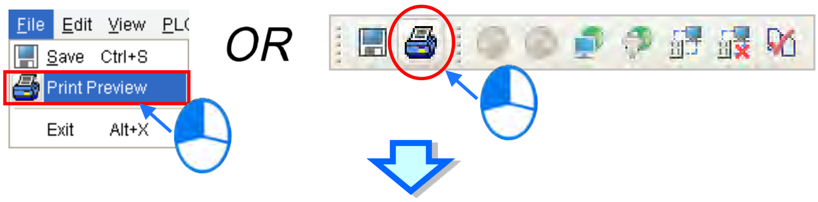
9.3 Managing and Applying NWCONFIG

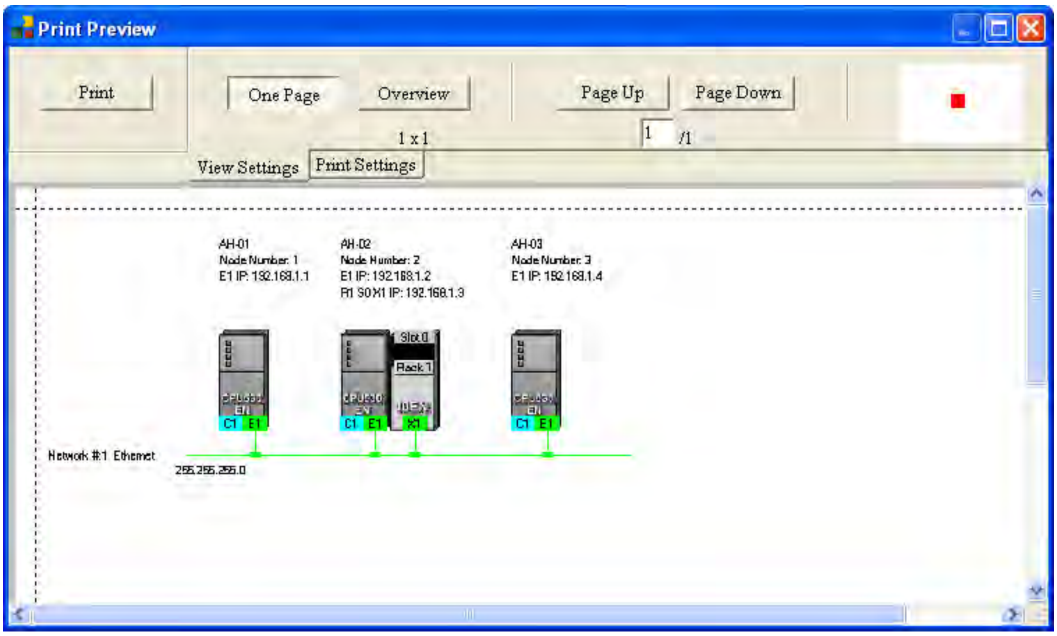
9.3.1 Saving Parameters and Printing a Network Framework

If users want to save the parameters set in NWCONFIG, they can click **Save** on the **File** menu, or on the toolbar. The parameters which can be saved are the network framework created in NWCONFIG, the parameters related to the PLC Links constructed, and the parameters related to the Ether Links constructed. After the saving of the parameters set in NWCONFIG is complete, an nw file whose primary filename is the project name/group name, and an nwsd file whose primary filename is the project name/group name will appear in the folder in which the project/group of projects is/are saved.



After the users click **Print Preview** on the **File** menu, or on the toolbar, the system will automatically open the **Print Preview** window, and the network framework that the users create in NWCONFIG will be displayed in the **Print Preview** window. Please refer to appendix C for more information.





Before the users print the data related to a PLC Link or an Ether Link, they have to export the data as a CSV file. After the CSV file is opened in Microsoft Excel, they can print the data in the CSV file.

9.3.2 Downloading Parameters

In the working area in NWCONFIG, users can download the routing tables produced to PLCs, the parameters related to the PLC Links constructed, and the parameters related to the Ether Links constructed to the nodes. The users have to download the routing tables produced to nodes in the working area.

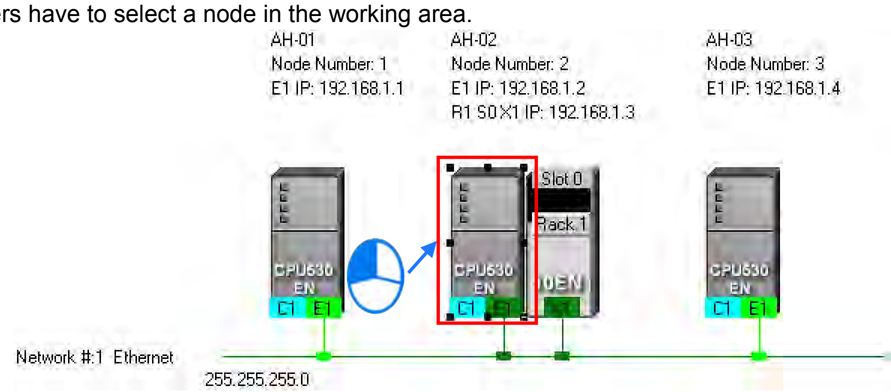
9.3.2.1 Introduction of Parameters

- **Routing table**
  The routing data stored in a PLC is data related to the PLC itself, and therefore the routing tables downloaded to nodes are different.
- **Parameters related to a PLC Link**
  The parameters related to a PLC Link can only be downloaded to the PLC designated as a master station. If the parameters related to a PLC Link are downloaded to a slave station, the related special relays and the related special registers in the slave station will be restored to the default setting. There is only one master station in a network. If users are not sure whether a device was designated as a master station, and whether the parameters related to a PLC Link was downloaded to the device, they have to download the parameters related to a PLC Link to the device.
- **Parameters related to an Ether Link**
  The parameters related to an Ether Link must be downloaded to the data demanding nodes. However, the data exchange table stored in a PLC is a table related to the PLC itself. Besides, if the parameters set include a node which does not demand any data, the data in the node will be cleared after the parameter are downloaded to the node, and the start mode of the node will depend on the parameters after the parameters are downloaded to the node.

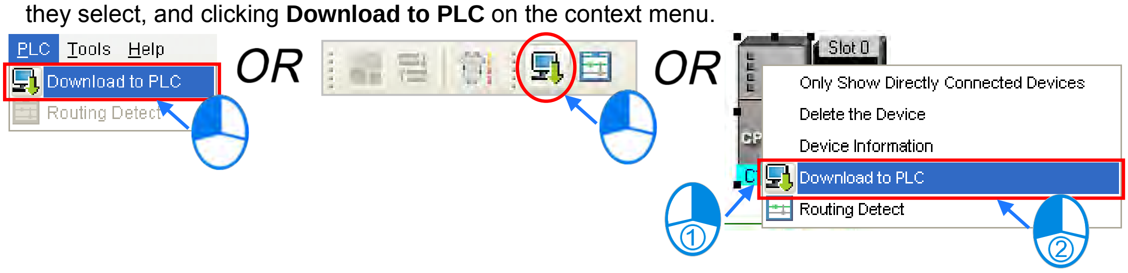
9.3.2.2 Description of Downloading Parameters

If the users want to download parameters, the **Routing Mode** checkbox in the **Select a Driver** window must be unselected. Please refer to section 9.1.3 for more information.

- **Single node**
  The users have to select a node in the working area.

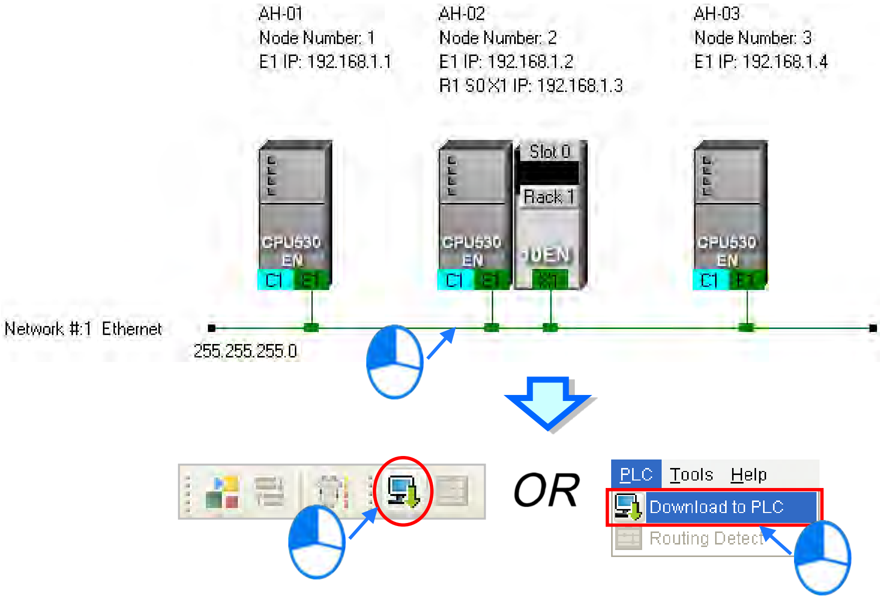


After the users click **Download to PLC** on the **PLC** menu, or  on the toolbar, the **Optional Download** window will appear. The users can also open the **Optional Download** window by right-clicking the device they select, and clicking **Download to PLC** on the context menu.

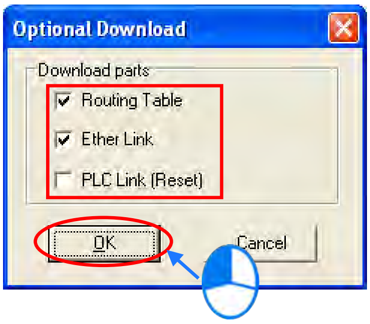


- **Multiple nodes**

  The users have to select an Ethernet network in the working area. After the users click **Download to PLC** on the **PLC** menu, or on the toolbar, the **Optional Download** window will appear. If the actual connection is consistent with the setting in NWCONFIG, parameters can be downloaded to the nodes connected to the Ethernet network.



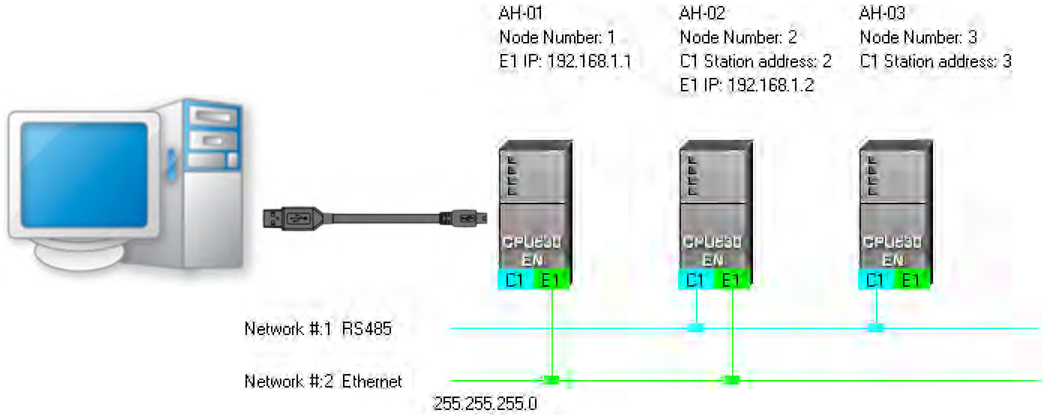
After the users follow the steps described above, the **Optional Download** window will appear. If a checkbox in the **Optional Download** window is gray, the checkbox can not be selected. After the users select checkboxes in the **Optional Download** window, they can click **OK**.



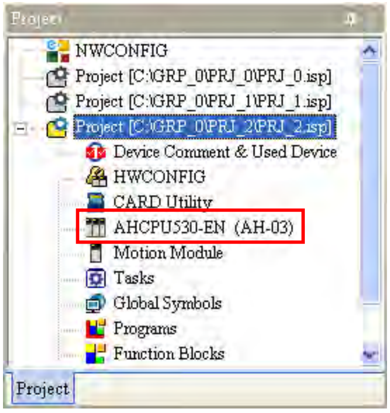
9.3.3 Using Routing in ISPSoft

After users create a network architecture in NWCONFIG, and download the routing tables produced to PLCs, they can download data to a device which is not directly connected to ISPSoft through routing, upload data from a device which is not directly connected to ISPSoft through routing, or monitor data in a device which is not directly connected to ISPSoft through routing. If the users want to use routing in ISPSoft, the devices used must be AH500 series CPU modules.

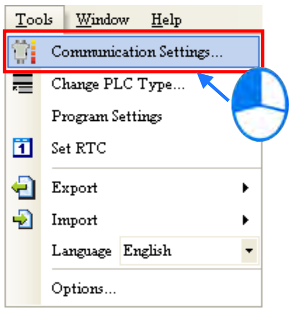
In the figure below, the PLC which actually connects to the computer is AH-01. AH-03 can be monitored through routing.



(1) Users have to activate the project for AH-03.



(2) Click the **Tools** menu, and then click **Communication Settings…**.

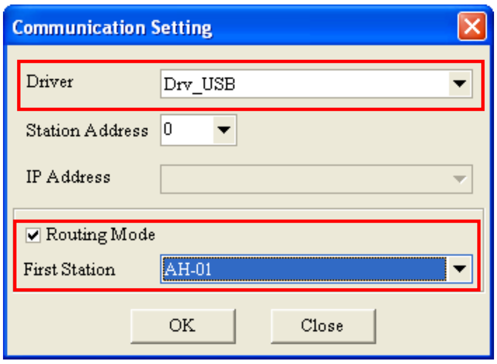


(3) In the **Communication Setting** window, the users have to select the **Routing Mode** checkbox, and

select a device in the **First Station** drop-down list box.

Generally speaking, the device which actually connects to the computer is the first station. If the computer connects to several devices, or connect to devices through Ethernet, the users have to designate a device as the first station according to the network framework created in NWCONFIG. Besides, if the **Routing Mode** checkbox is selected, the driver selected in the **Driver** drop-down list box must be a driver which can connect to the first station.

After the users click **OK** in the **Communication Setting** window, AH-03 can be monitored through AH-01.



Additional remark

Before users use routing, they have to create projects, configure hardware, and configure a network. Please refer to section 9.1.4 for more information. The users can also refer to section 9.1.3 for more information about the communication setting in NWCONFIG.

MEMO

Chapter 10 Operating Principle of the CPU Module

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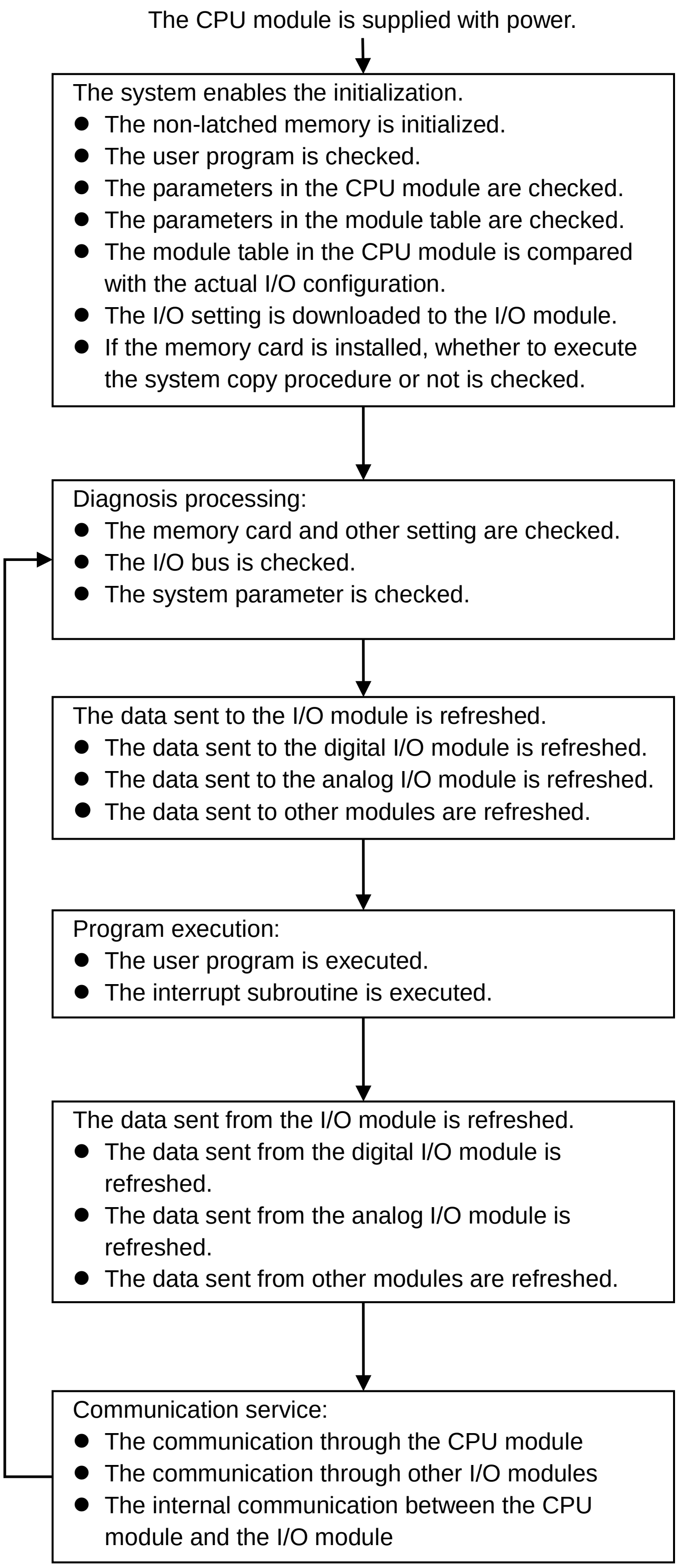
10.1 Operation of the CPU Module

10.1.1 Procedure

The operation of the CPU module is described below.



10.1.2 I/O Refreshing and Communication Service

- **I/O refreshing**

  A CPU module reads external I/O data periodically or output data to external I/O. I/O refreshing includes the following.

  - Refreshing data in a digital I/O module
  - Refreshing data in an analog I/O module
  - Refreshing data in a network module
  - Refreshing data in a motion control module

  All I/O refreshing is executed in the same loop. The data in an input device is refreshed before a program is executed, and the data in an output device is refreshed after the program is executed.

Unit	Maximum data exchange	Data exchange area
Digital I/O module	It depends on the number of input/output channels in the unit.	Input relay/Output relay
Analog I/O module	It depends on the number of input/output channels in the unit.	Data register
Network module	It depends on the unit.	Data register
Motion control module	It depends on the unit.	Data register

- **Communication service**

  Communication service is nonscheduled communication service of a network module. It includes the communication request sent from external equipment to a CPU module, and the communication request sent from the CPU module to the external equipment.

10.2 Operating Modes of the CPU Module

10.2.1 Operating Modes

There are two operating modes. They can be used to control a user program and all tasks.

STOP mode: A program is not executed under this mode. Users can download a module table, initialize CPU configuration and other setting, download a program, check a program, and force a bit ON/OFF.

RUN mode: A program is executed under this mode. Users can not download a module table, and initialize CPU configuration and other setting.

10.2.2 Statuses and Operation under Different Operating Modes

The STOP mode and the RUN mode are modes for a CPU module. The statuses and operation under these modes are listed below.

- **Basic operation**

CPU mode	Program	I/O refreshing	External output	Program memory	
				Non-latched area	Latched area
STOP	The execution of the program stops.	The I/O refreshing is executed.	OFF (If users set the I/O module so that the final state of the external output on the I/O module is retained, the final state of the external output on the I/O module will be retained.)	The data in the program memories are retained.	
RUN	The program is executed.	The I/O refreshing is executed.	The external output is controlled by the program.	The program memories are controlled by the program.	

- **Relation between the operating modes and the tasks**

Mode	Loop task	Interrupt task
STOP	The execution of the loop task stops.	The execution of the interrupt task stops.
RUN	● The tasks which have not been executed are in the halt state. ● If a task is active, or the instruction TKON is executed, the task is executed. ● If a task is not active, or the instruction TKOFF is executed, the task is not executed.	If the condition of the interrupt is met, the task is executed.

- **Relation between the change of the modes and the program memory**

Change of the mode	Non-latched area	Latched area
STOP→RUN	Whether the data is cleared or retained depends on user's setting.	The data is retained.
RUN→STOP	The data is retained.	The data is retained.

Chapter 11 Convenient Functions

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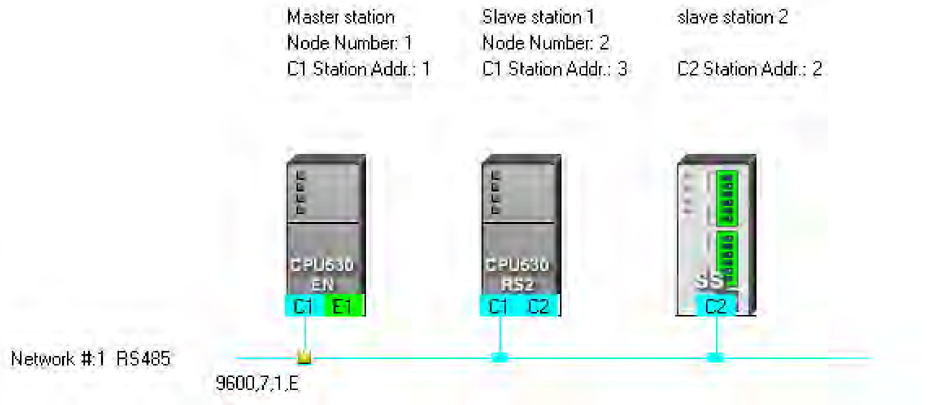
11.1 PLC Link (for AHCPU5X0 models)

This function is applicable for AH500 basic CPU module series (AHCPU500/510/520/530).

11.1.1 Introduction of a PLC Link

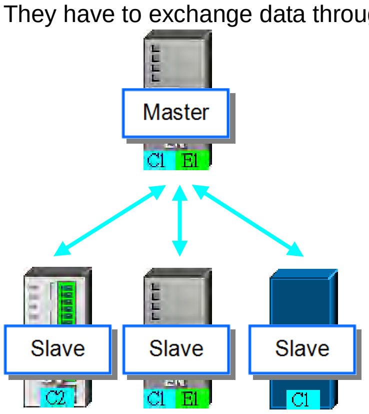
A PLC Link is a network mechanism for data exchange performed through an RS-485 cable. If there are several nodes in an RS-485 network, users can create a mechanism for data exchange in the network. If the parameters which are set are downloaded to the PLC which functions as a master station, the system of the PLC will perform data exchange through special auxiliary relays and special data registers when the PLC runs.



11.1.2 Constructing a PLC Link in NWCONFIG in ISPSoft

Constructing a PLC Link

A PLC Link is a network mechanism for data exchange performed through an RS-485 cable. If there are several nodes in an RS-485 network, users can create a mechanism for data exchange in the network. If the parameters which are set are downloaded to the PLC which functions as a master station, the system of the PLC will perform data exchange through special auxiliary relays and special data registers when the PLC runs. A PLC Link is a master/slave model. There is only one master station in an RS-485 network, and the other stations which are slave stations passively receive reading/writing commands from the master station. The slave stations can not exchange data. They have to exchange data through the master station.

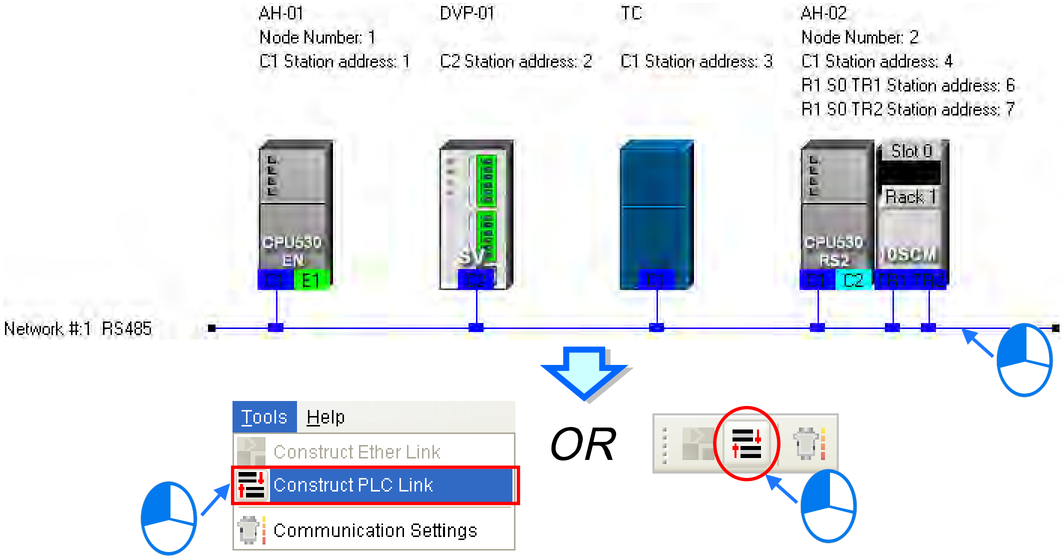


11.1.2.1 Opening the PLC Link Table Editor Window

Before creating a PLC Link, users have to make sure that all the network setting is correct. Please use one of the methods described below.

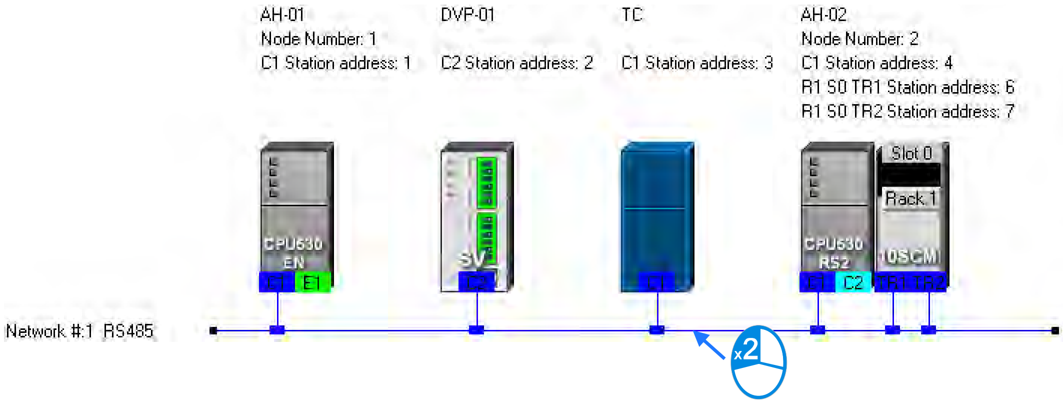
- **Method 1**

  After the users select a network, they have to click **Construct PLC Link** on the **Tools** menu, or [icon] on the toolbar.

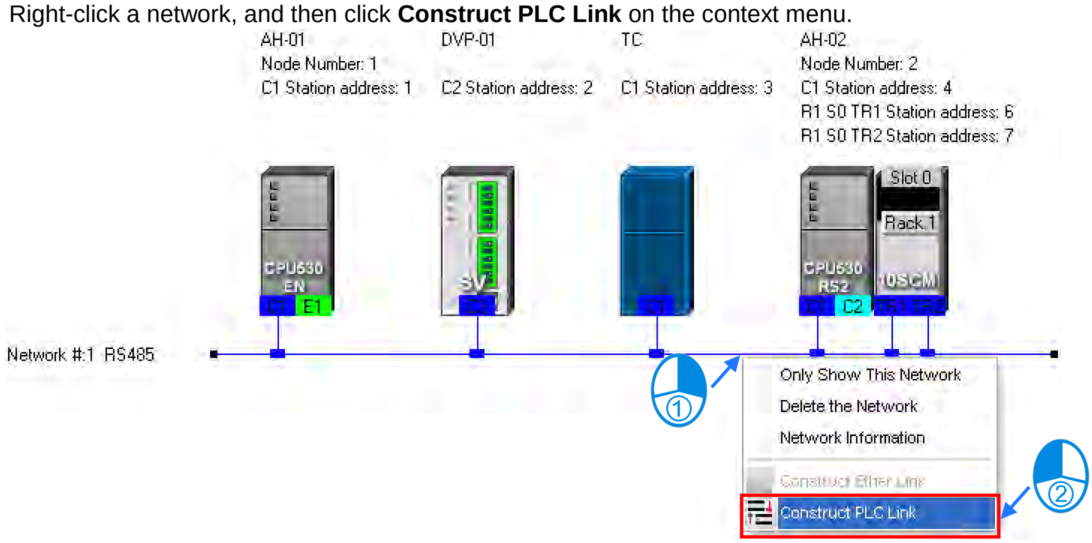


- **Method 2**

  Double-click network.



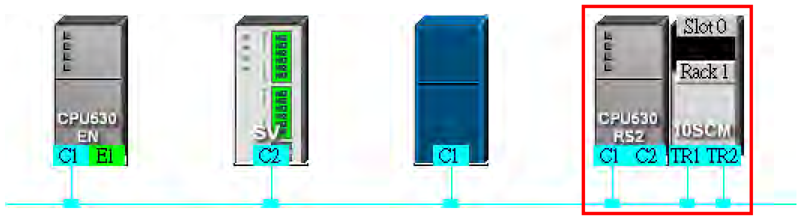
- **Method 3**
  Right-click a network, and then click **Construct PLC Link** on the context menu.



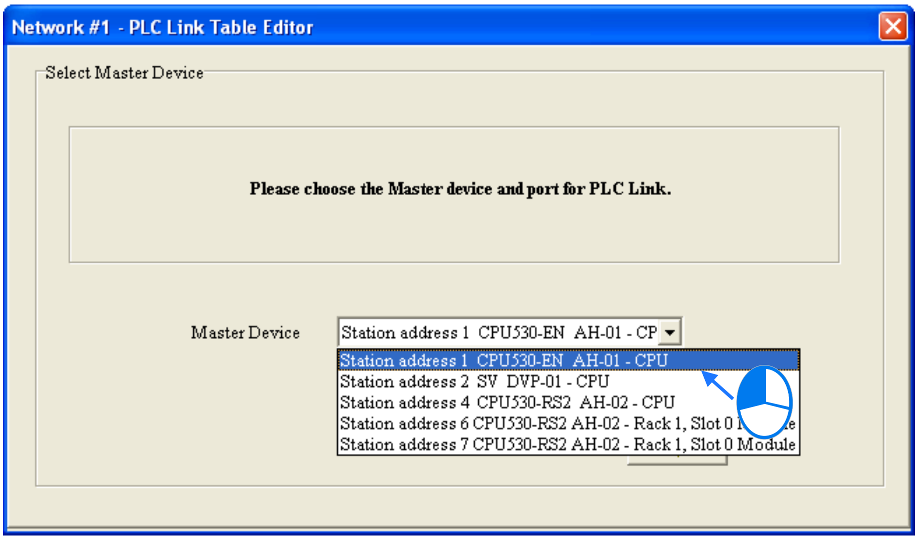
After the users use one of the methods described above, the **PLC Link Table Editor** window will be opened. The **PLC Link Table Editor** window leads the users to construct a PLC Link step by step. The steps of constructing a PLC Link are designating a port as a master station, setting communication parameters, and creating a data exchange table. The system leads the users to the operation screen displayed last time as soon as the **PLC Link Table Editor** window is opened. As a result, if the users construct a PLC Link for the first time, the screen displayed will lead the users to accomplish the first step.
Besides, a PLC Link is executed through special auxiliary relays and special data registers. The construction tool introduced here is just a friendly user interface which helps users download the parameters related to a PLC Link to the related special auxiliary relays and the related special data registers. The exact execution of a PLC Link depends on the special auxiliary relays and the special data registers in a PLC. To ensure that the PLC Link constructed can operate normally, users have to make sure of the functions of the PLCs and the limitations of the PLCs with regard to the PLC Link.

11.1.2.2 Designating a Port as a Master Station (Step 1)

Only an AH500 series CPU module, an AH500 series module, a DVP series PLC, or a DVP series module can be designated as the master station. Not all ports of a PLC or a module can be designated as the master station, and therefore users have to read the usage of the PLC or the module before they designate a port as the master station. Besides, if some of the ports of a node can be designated as masters, the PLC which is a part of the node will execute the PLC Link no matter what port is designated as a master station.



(1) Select a port of a node in the **Master Device** drop-down list box. Only the ports which can be designated as master stations are listed.

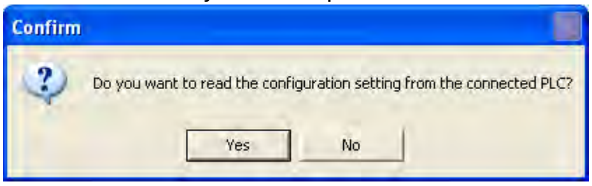


(2) After users click , the system will ask the users whether they want to upload the setting related to a PLC Link through the master station. If the users click **No**, they will be led to the second step. If the users click **Yes**, the setting related to a PLC Link in the PLC which is a part of the node will be uploaded through the master station, and the data uploaded will be displayed on the screen after the users are led to the third step. Before the users upload the data, they have to make sure of the following points.

(a) The users have to make sure that the computer and the port designated as a master station are connected by means of a communication cable.

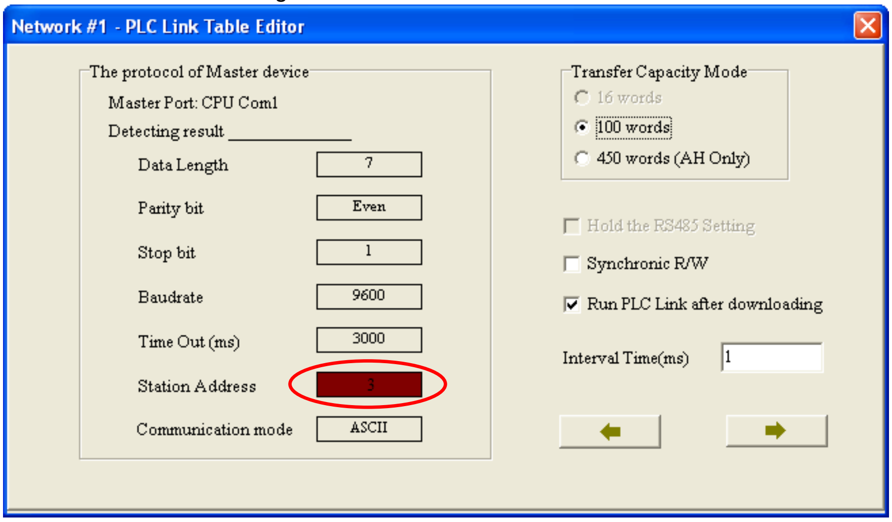
(b) The users have to make sure that a driver has been created correctly, and the driver is NOT in the state of Error.

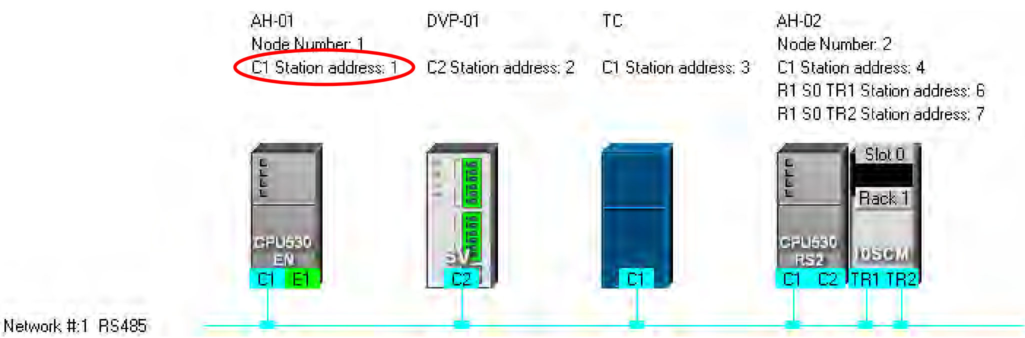
(c) The users have to make sure that they have completed the communication setting in NWCONFIG.



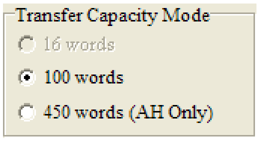
11.1.2.3 Setting Communication Parameters (Step 2)

After the system leads users to the second step, the users have to set the communication parameters in the **PLC Link Table Editor** window. The parameters uploaded through the master station are displayed at the left part of the window. The setting of the communication parameters of all the slave stations in the same network must be the same as the setting of the communication parameters of the master station. If no parameters are uploaded, “Unknown” will be shown in the boxes at the left part of the window. If the station address uploaded is different form the station address assigned o the master station, the **Station Address** box will become red.



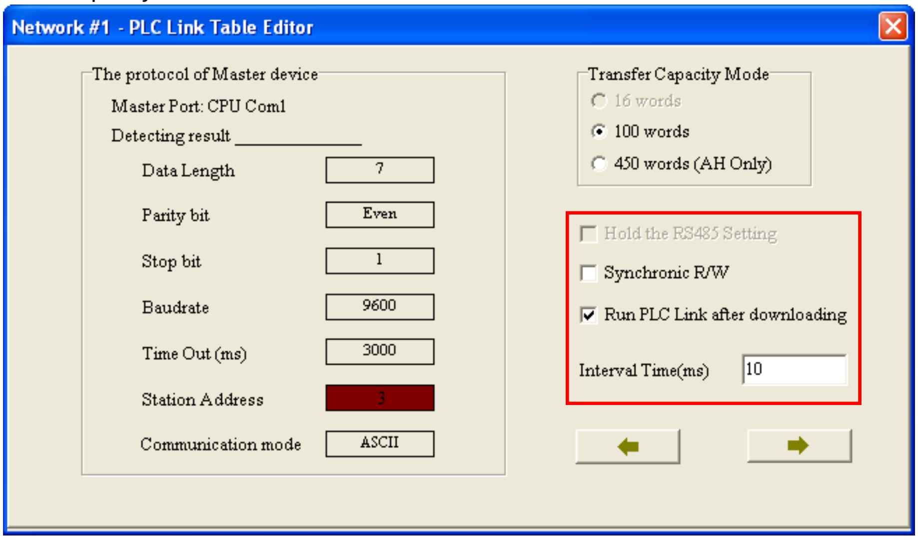


- **Transfer Capacity Mode**
  The users can set 16 data exchange groups or 32 data exchange groups, depending on the model selected. The users can select a maximum data length in the **Transfer Capacity Mode** section. Besides, the maximum data length which can be set varies with the PLC which is designated as a master station. Please refer to manuals for more information.
  If an AH500 series CPU module or an AH500 series module is designated as a master station, the **450 words (AH Only)** option button in the **Transfer Capacity Mode** section can be selected. Only AH500 series CPU modules allow 450-word data to be exchanged. As a result, if the **450 words (AH Only)** option button in the **Transfer Capacity Mode** section is selected, the DVP series PLCs and the other devices can not execute a PLC Link.



- **Hold the RS485 Setting**
  Generally speaking, the communication parameters in a DVP series PLC will be restored to the default values if the DVP series PLC is turned on after a power failure. However, if the **Hold the RS485 Setting** checkbox is selected, the communication parameters stored will be loaded again if a DVP series PLC runs after it is stopped. Please refer to manuals for more information about the communication parameters in DVP series PLCs.

- **Synchronic R/W**
  Generally speaking, a master station sends a writing command and a reading command to a slave station separately. If the **Synchronic R/W** checkbox is selected, the master station can complete reading and writing simultaneously by means of a specific Modbus function code (the hexadecimal code 17), and the efficiency of data exchange is increased. However, the users have to make sure that the devices involved in data exchange support the Modbus function code before they select the **Synchronic R/W** checkbox. If the devices do not support the Modbus function code, the Modbus code can not be identified, and the reading/writing of data will fail after they receive the commands from the master station.
- **Run PLC Link after downloading**
  If the **Run PLC Link after downloading** checkbox is selected, the PLC Link constructed will be enabled after the PLC Link constructed is downloaded to the PLC connected to the computer.
- **Interval Time (ms)**
  The users can specify how often the master station sends a command.

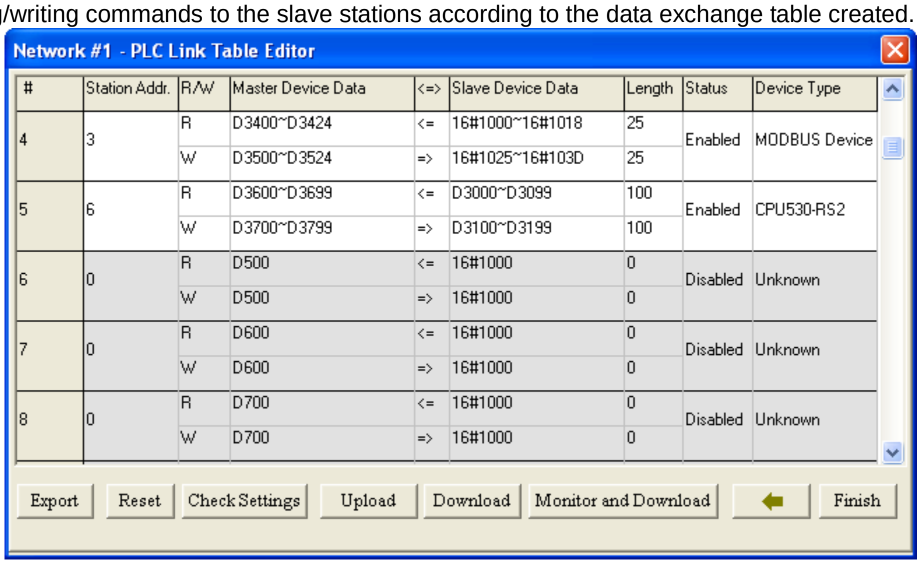


After the users click ➡, the system will lead the users to the next step. If the users click ⬅, the system will lead the users to the previous step.

11.1.2.4 Creating a Data Exchange Table (Step 3)

A. Introduction of a Data Exchange Table

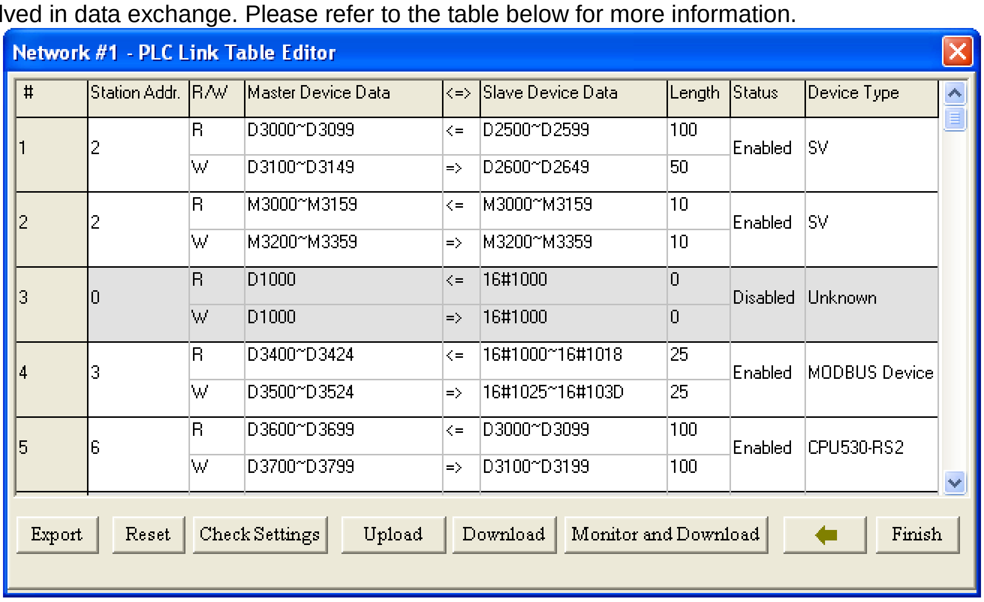
The table below is a data exchange table. When a PLC Link is executed, the master station sends reading/writing commands to the slave stations according to the data exchange table created.



#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
4	3	R	D3400~D3424	<=	16#1000~16#1018	25	Enabled	MODBUS Device
		W	D3500~D3524	=>	16#1025~16#103D	25		
5	6	R	D3600~D3699	<=	D3000~D3099	100	Enabled	CPU530-RS2
		W	D3700~D3799	=>	D3100~D3199	100		
6	0	R	D500	<=	16#1000	0	Disabled	Unknown
		W	D500	=>	16#1000	0		
7	0	R	D600	<=	16#1000	0	Disabled	Unknown
		W	D600	=>	16#1000	0		
8	0	R	D700	<=	16#1000	0	Disabled	Unknown
		W	D700	=>	16#1000	0		

Column	Description
Serial Number (#)	The data exchange groups in the data exchange table in the **PLC Link Table Editor** window are numbered. Users can set 16 data exchange groups or 32 data exchange groups, depending on the model selected.
Station Addr.	The slave station address which belongs to a data exchange group is indicated. A station address can belong to several data exchange group. Besides, the station address 0 represents an undefined slave station, and is not a broadcast station address.
R/W	R: The master station reads the data in devices in a slave station. W: The master station writes data into devices in a slave station.
Master Device Data	The range of devices which are used in the master station is indicated.
<=>	<=: The master station reads the data in devices in a slave station. =>: The master station writes data into devices in a slave station.
Slave Device Data	The devices which are used in a slave station are indicated. If a slave station is a user-defined Modbus device, the devices used will be represented by hexadecimal addresses.
Length	A data length is indicated. A length indicates the number of devices used.
Status	Users can decide whether to involve a data exchange group in data exchange. If a data exchange group is set incorrectly, the data exchange group will not be involved in data exchange. If a data exchange group is not involved in data exchange, the related data will be on a gray ground.
Device Type	The device types shown are consistent with the device names shown in the working area in NWCONFIG. If a slave station address is assigned to a network module, the name of the PLC to which the network module is connected will be shown. Besides, if a slave station is undefined, it is unknown.

The figure below is an example of a data exchange table. Group #1, group #2, group #4, and group #5 are involved in data exchange. Please refer to the table below for more information.


Network #1 - PLC Link Table Editor

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	2	R	D3000~D3099	<=	D2500~D2599	100	Enabled	SV
		W	D3100~D3149	=>	D2600~D2649	50		
2	2	R	M3000~M3159	<=	M3000~M3159	10	Enabled	SV
		W	M3200~M3359	=>	M3200~M3359	10		
3	0	R	D1000	<=	16#1000	0	Disabled	Unknown
		W	D1000	=>	16#1000	0		
4	3	R	D3400~D3424	<=	16#1000~16#1018	25	Enabled	MODBUS Device
		W	D3500~D3524	=>	16#1025~16#103D	25		
5	6	R	D3600~D3699	<=	D3000~D3099	100	Enabled	CPU530-RS2
		W	D3700~D3799	=>	D3100~D3199	100		

Export Reset Check Settings Upload Download Monitor and Download Finish

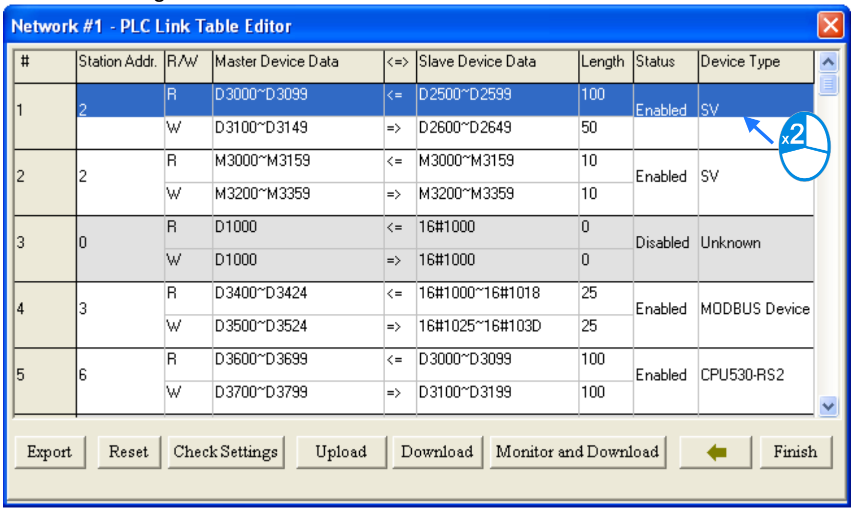
Serial number	Description
#1	The master station reads the data in D2500~D2599 in the slave station whose station number is 2, and stores the data in D3000~D3099 in itself. Meanwhile, the data in D3100~D3149 in the master station is written into D2600~D2649 in the slave station.
#2	The master station reads the data in M3000~M3159 in the slave station whose station number is 2, and stores the data in M3000~M3159 in itself. Meanwhile, the data in M3200~M3359 in the master station is written into M3200~M3359 in the slave station.
#4	The master station reads the data in 16#1000~16#1018 in the slave station whose station number is 3, and stores the data in D3400~D3424 in itself. Meanwhile, the data in D3500~D3524 in the master station is written into 16#1025~16#103D in the slave station.
#5	The master station reads the data in D3000~D3099 in the slave station whose station number is 6, and stores the data in D3600~D3699 in itself. Meanwhile, the data in D3700~D37999 in the master station is written into D3100~D3199 in the slave station.

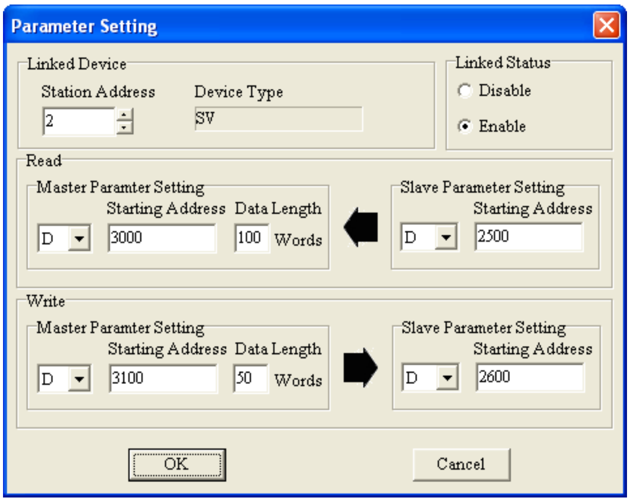
Additional remark

If “Disabled” appears in the **Status** cell for a data exchange group, the data exchange group will not be involved in data exchange, and the system will ignore the setting in other cells for the data exchange group. Besides, if the setting of a data exchange group becomes incorrect after a modification, “Disabled” will appear in the **Status** cell for the data exchange group.

B. Setting a Data Exchange Group

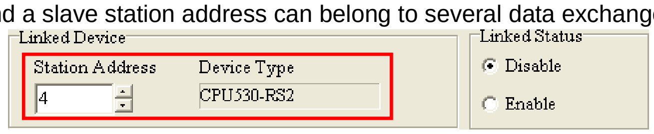
If users want to set the parameters for a data exchange group, they can double-click the data exchange group in the data exchange table in the **PLC Link Table Editor** window.





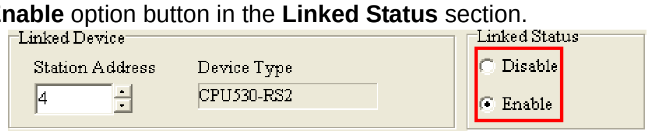
- **Linked Device**

  The users can select a slave station address which belongs to this data exchange group. The device type displayed in the **Device Type** box is a model name displayed in the working area in NWCONFIG. If the slave station address selected is assigned to a port of a network module, the name of the PLC to which the network module is connected will be shown in the **Device Type** box. If the slave station address selected is undefined, or is not involved in the PLC Link constructed, “Unknown” will be displayed in the **Device Type** box. Besides, the station address assigned to the master station can not be selected, and a slave station address can belong to several data exchange groups.



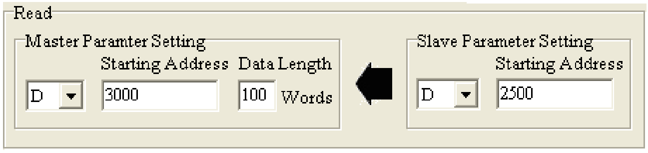
- **Linked Status**

  After the users select a slave station address which can be used, they can select the **Disable** option button, or the **Enable** option button in the **Linked Status** section.



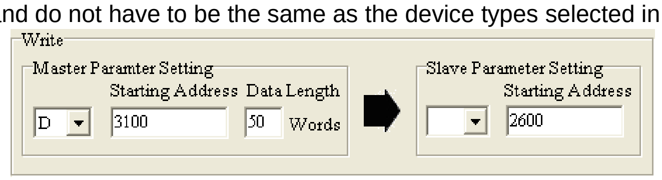
- **Read**

  The users can select a device type, type a starting address, and type a data length in the **Master Parameter Setting** section. They can select a device type, and type a stating address in the **Slave Parameter Setting** section. Generally speaking, the device types selected in the **Read** section must be the same, and do not have to be the same as the device types selected in the **Write** section.



- **Write**

  The users can select a device type, type a starting address, and type a data length in the **Master Parameter Setting** section. They can select a device type, and type a stating address in the **Slave Parameter Setting** section. Generally speaking, the device types selected in the **Write** section must be the same, and do not have to be the same as the device types selected in the **Read** section.



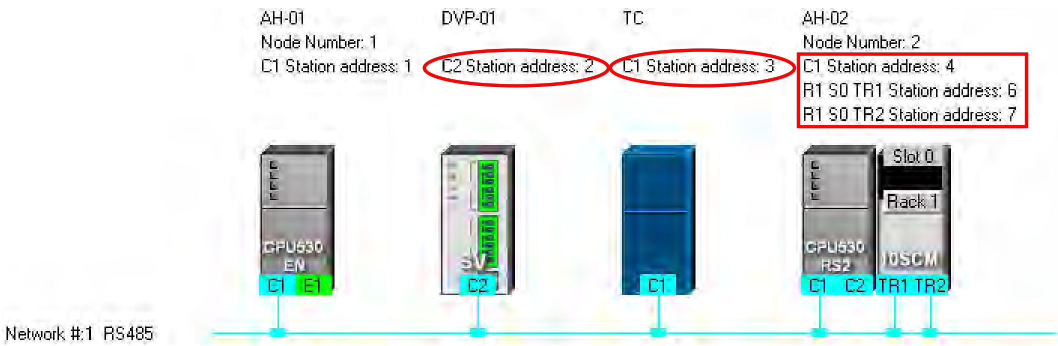
The data in a group of devices can be written into several different groups of devices, but the data in different groups of devices are not allowed to be stored in the same group of device. Take the figure above for example. The data in D3100~D3149 in the master station can be written into different slave stations, but D3000~D3099 in the master station can not receive the data in devices other than D2500~D2599 in the slave station whose station address is 2. Besides, the device types selected in the **Read**/**Write** section must be the same. However, the limitation on the setting of a data exchange group varies with the master station/slave station selected or the communication parameters selected.

Related setting	Description
The **450 words (AH Only)** option button in the **Transfer Capacity Mode** section is selected.	Only AH500 series CPU modules allow 450-word data to be exchanged. As a result, if the **450 words (AH Only)** option button in the **Transfer Capacity Mode** section is selected, the DVP series PLCs and the other devices can not execute a PLC Link. The users can only select M devices, D devices, or L devices in the **Read/Write** section. The device types selected in the **Read/Write** section do not have to be the same.
The **16 words** option button in the **Transfer Capacity Mode** section is selected.	If the master station selected is a DVP series PLC, the **16 words** option button in the **Transfer Capacity Mode** section can be selected. If the **16 words** option button in the **Transfer Capacity Mode** section is selected, the starting device address in the **Read/Write** section will be a certain special data register, and the users can only specify a data length.
The slave station selected is a user-define device.	If the slave station selected is a Modbus device, the devices used will be represented by hexadecimal addresses, and the users can select word devices or bit devices.
The **Synchronic R/W** checkbox is selected.	If the **450 words (AH Only)** option button is not selected, the users can only select D devices in the **Read/Write** section after the **Synchronic R/W** checkbox is selected.

C. Consistency Between a Data Exchange Table and the Network Created in NWCONFIG

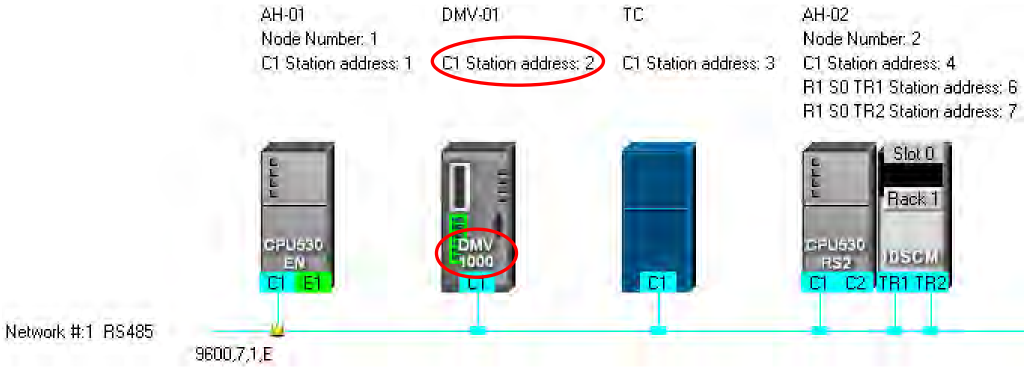
The device types shown in the data exchange table in the **PLC Link Table Editor** window are consistent with the device names shown in the working area in NWCONFIG. Besides, if a slave station address is assigned to a port of a network module, the name of the PLC to which the network module is connected will be shown.

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	2	R	D0~D99	<=	D100~D199	100	Enabled	SV
		W	D0~D99	=>	D200~D299	100		
2	3	R	D100~D199	<=	16#1000~16#1063	100	Enabled	MODBUS Device
		W	D100~D199	=>	16#1000~16#1063	100		
3	4	R	D200~D299	<=	D100~D199	100	Enabled	CPU530-RS2
		W	D200~D299	=>	D200~D299	100		
4	6	R	D300~D399	<=	D100~D199	100	Enabled	CPU530-RS2
		W	D300~D399	=>	D200~D299	100		
5	7	R	D400~D499	<=	D100~D199	100	Enabled	CPU530-RS2
		W	D400~D499	=>	D200~D299	100		



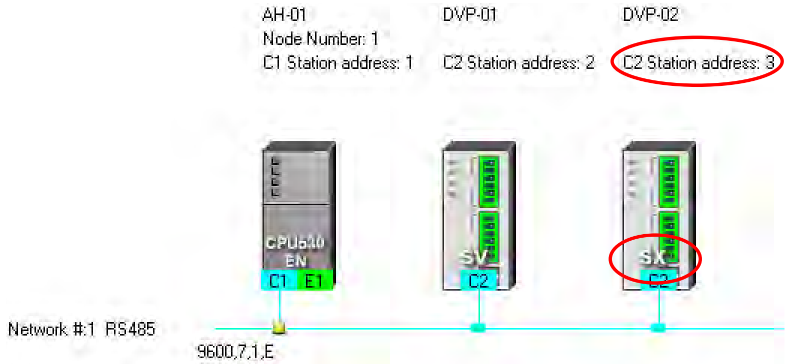
If users change the model to which a station address is assigned in NWCONFIG after a PLC Link is constructed, the new model name appearing in the **Device Type** cell for the station address will be in red, and “Disabled” will appear in the **Status** cell for the station address. The users have to check whether the setting is correct. If the setting is incorrect, the users have to modify the incorrect parts. After the users modify the incorrect parts, they can select the **Enable** option button in the **Linked Status** section.

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	2	R	D3000~D3099	<=	D2500~D2599	100	Disabled	DMV1000
		W	D3100~D3149	=>	D2600~D2649	50		



If the data uploaded from the master station which is an AH500 series CPU module is not consistent with the network created in NWCONFIG, the device types shown in the data exchange table in the **PLC Link Table Editor** window will still be consistent with the device names shown in the working area in NWCONFIG, the incorrect device types will be in red, and “Disabled” will appear in the **Status** cell for the incorrect device types. The users have to check whether the setting is correct. If the setting is incorrect, the users have to modify the incorrect parts. After the users modify the incorrect parts, they can select the **Enable** option button in the **Linked Status** section.

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
2	3	R	D100~D115	<=	D100~D115	16	Disabled	SX
		W	D100~D115	=>	D200~D215	16		



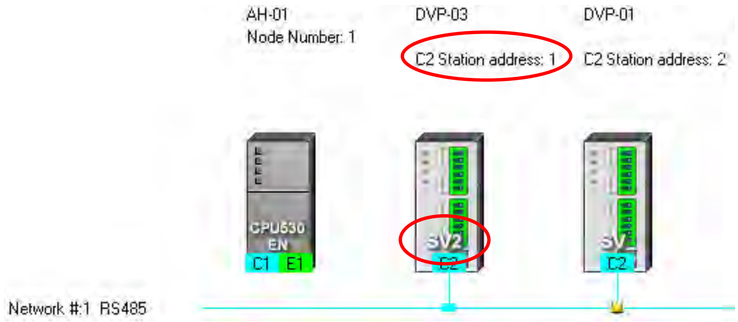
The device types in the data exchange table in the **PLC Link Table Editor** window can not be stored in a DVP series PLC, and therefore the users do not know whether the data uploaded from the DVP series PLC is consistent with the network created in NWCONIFG. The device types shown in the data exchange table in the **PLC Link Table Editor** window is consistent with the device names shown in the working area in NWCONFIG. If the device ranges set for a model is incorrect, “Disabled” will appear in the **Status** cell for the model. The users have to modify the incorrect parts. After the users modify the incorrect parts, they can select the **Enable** option button in the **Linked Status** section.

The figure below is a data exchange table which is downloaded to a DVP-SV series PLC. The slave station to which the station address 1 is assigned is AHCPU530-EN.

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	1	R	D0~D99	<=	D32000~D32099	100	Enabled	CPU530-EN
		W	D100~D199	=>	D200~D299	100		

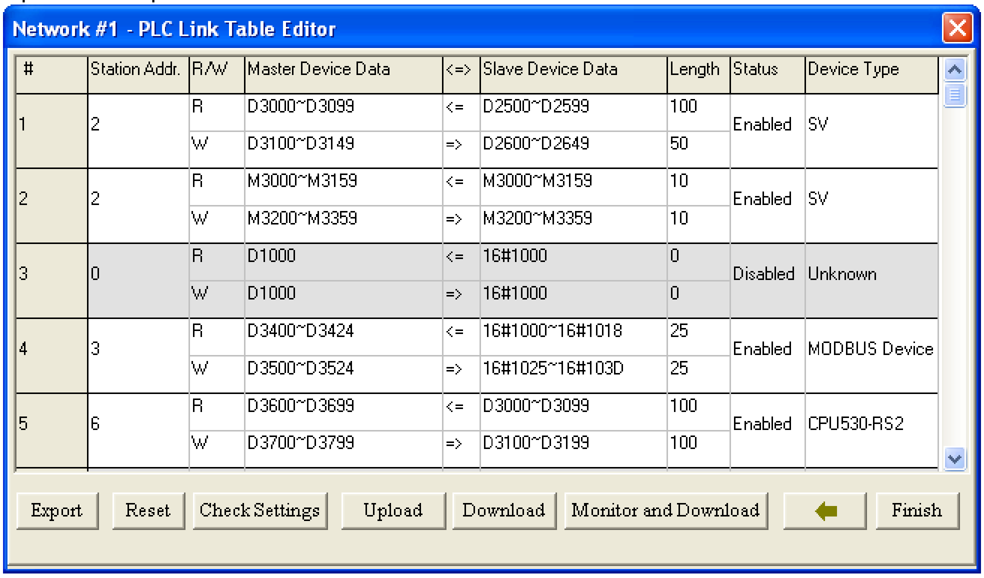
The present network created in NWCONFIG is shown below. The slave station to which the station address 1 is assigned is a DVP-SV2 series PLC. After the data exchange table in the DVP-SV series PLC is uploaded, the device types shown in the data exchange table in the **PLC Link Table Editor** window will be consistent with the device names shown in the working area in NWCONFIG. The device ranges set for the DVP-SV2 series PLC is not within the device range for DVP-SV2 series PLC, and therefore “Disabled” appears in the **Status** cell for the DVP-SV2 series PLC.

#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	1	R	D0~D99	<=	Address error	100	Disabled	SV2
		W	D100~D199	=>	Address error	100		



D. Managing a Data Exchange Table

There are buttons under the data exchange table in the **PLC Link Table Editor** window. Please refer to the table below for more information about the buttons. If users click [←], the system will lead the users to the previous step.



#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	2	R	D3000~D3099	<=	D2500~D2599	100	Enabled	SV
		W	D3100~D3149	=>	D2600~D2649	50		
2	2	R	M3000~M3159	<=	M3000~M3159	10	Enabled	SV
		W	M3200~M3359	=>	M3200~M3359	10		
3	0	R	D1000	<=	16#1000	0	Disabled	Unknown
		W	D1000	=>	16#1000	0		
4	3	R	D3400~D3424	<=	16#1000~16#1018	25	Enabled	MODBUS Device
		W	D3500~D3524	=>	16#1025~16#103D	25		
5	6	R	D3600~D3699	<=	D3000~D3099	100	Enabled	CPU530-RS2
		W	D3700~D3799	=>	D3100~D3199	100		

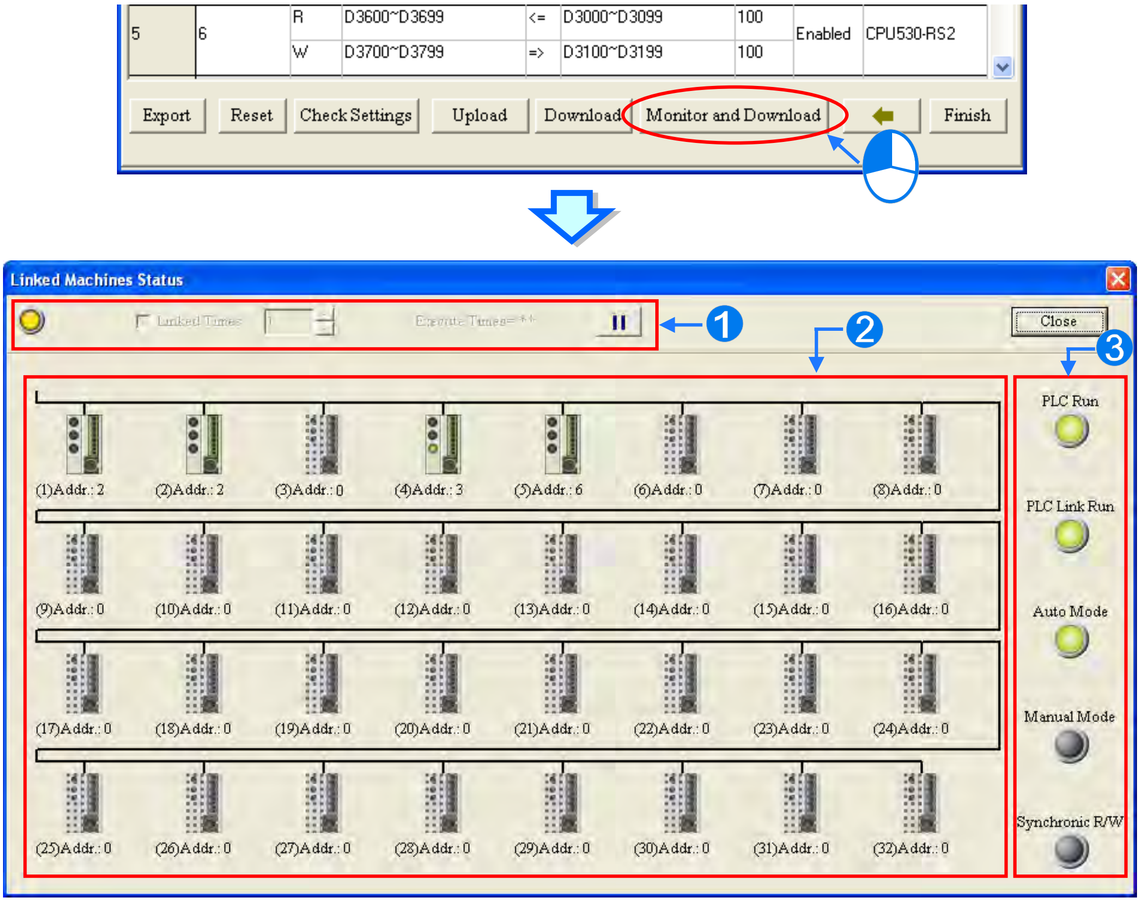
Item	Description
Export	The data in the data exchange table can be exported as a CSV file. The users can edit the CSV file through Microsoft Excel. The CSV file can also be used as reference material for another development work.
Reset	After the users click the button, the setting in the data exchange table will be restored to the initial setting.
Check Settings	After the users click the button, the data exchange table will be checked.
Upload	After the users click the button, the parameters related to a PLC Link in the master station will be uploaded.
Download	After the users make sure that the setting of a PLC Link is correct, they can download the setting to the master station by clicking the button.
Monitor and	After the users make sure that the setting of a PLC Link is correct, they can

Item	Description
Download	download the setting to the master station. After the setting is downloaded to the master station, the **Linked Machines Status** window will be opened automatically.
Finish	After the users click this button, the **PLC Link Table Editor** window will be closed. Before the **PLC Link Table Editor** window is closed, the system will ask the users whether they want to save the modifications they make.

During the execution of a PLC Link, the slave stations passively receive reading/writing commands from the master station. As a result, the parameters set in the data exchange table in the **PLC Link Table Editor** window are for the master station. If the users click **Upload**, the parameters related to a PLC Link in the master station will be uploaded. If the users click **Download**, the setting in the data exchange table in the **PLC Link Table Editor** window will be downloaded to the master station. Likewise, the master station will be monitored if the users click **Monitor and Download**. Before the users click **Upload**, **Download**, or **Monitor and Download**, they have to make sure that the device which is connected to the computer is the PLC which is designated as a master station, and the computer can communicate with the PLC normally. Please refer to section 20.1.3 for more information.

11.1.2.5 Monitoring a PLC Link

Before users monitor the PLC Link constructed, they have to make sure that the system is connect to the PLC which is designated as a master station normally. Please refer to section 20.1.3 for more information. After the users make sure that the PLC Link constructed is correct, they can click **Monitor and Download** under the data exchange table in the **PLC Link Table Editor** window to open the **Linked Machines Status** window. Besides, a PLC link can be executed normally only if the master station runs. As a result, the users have to make sure that the PLC which is designated as a master station runs before they monitor the PLC Link constructed.



❶ **Setting area**: The users can set the PLC Link constructed.
❷ **Monitoring area**: The status of the data exchange between the master station and the slave stations is displayed in this area. The users can also edit registers online in this area.
❸ **Indicators**: The LED indicators indicate the status of the PLC Link constructed. Please refer to the table below for more information.

Indicator	Description
PLC Run	When the PLC which is designated as a master station runs, the indicator is ON.
PLC Link Run	When the master station executes the PLC Link constructed, the indicator is ON.
Auto Mode	When the PLC Link constructed is executed automatically, the indicator is ON.
Manual mode	When the PLC Link constructed is executed manually, the indicator is ON. After the master station polls the slave stations a certain number of times, the indicator will be OFF.
Synchronic R/W	When the synchronic reading/writing function is enabled, the indicator is ON.

- **Setting area**

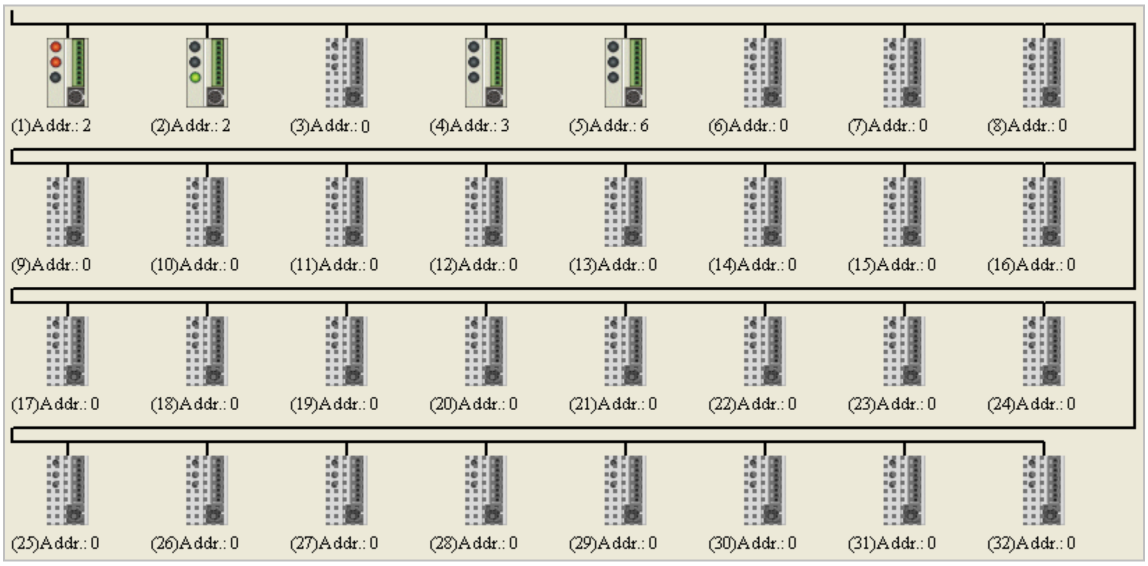
The users can set the PLC Link constructed. If the users set the PLC Link constructed, the values in the related special data registers in the master station and the states of the related special auxiliary relays in the master station will be changed. After the users click **Close**, the status of the PLC Link will remain unchanged. As a result, the users have to make sure that the status of the PLC Link constructed is correct before they click **Close**.

❶ When the computer is connected to the PLC which is designated as a master station, the indicator blinks.
❷ If the **Linked Times** checkbox is selected, the PLC Link constructed will be executed manually. If the **Linked Times** checkbox is unselected, the PLC Link constructed will be executed automatically.
❸ If the PLC Link constructed is executed manually, the users can set the number of times the master station polls the slave stations. The master station can poll the slave stations 65535 times at most. After the master station polls the slave stations a certain number of times, the PLC Link constructed will not be executed.
❹ If the PLC Link constructed is executed manually, the number of times the PLC Link is executed will be displayed. If the master station exchanges data with all the slave stations once, the number of times the PLC Links constructed is executed will be one.
❺ The users can start or stop the execution of the PLC Link constructed by clicking the button.

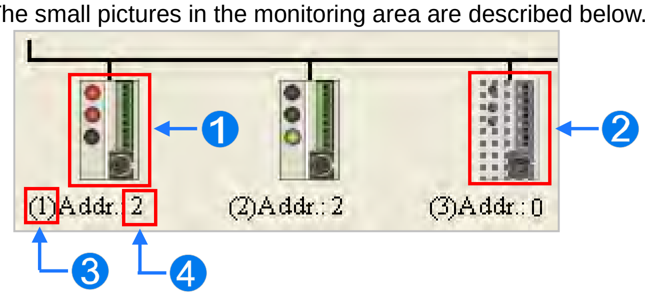
If the system is disconnect from the PLC which is designated as a master station while the PLC Link constructed is monitored, the **Continue to Monitor** button will appear in the upper right corner of the **Linked Machines Status** window. After the users eliminate the problem which results in the disconnection, they can click the **Continue to Monitor** button.

- **Monitoring area**

When the PLC Link constructed is executed, the master station exchanges data with the slave stations. The status of the data exchange between the master station and the slave stations are displayed in this area.

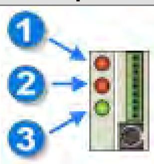
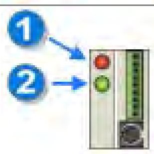


The small pictures in the monitoring area indicate the status of the main station rather than the statuses of the slave stations. The small pictures in the monitoring area are described below.

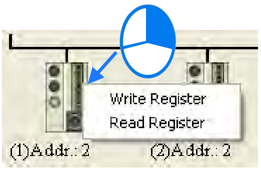


❶ The indicators on the small picture indicate the status of the data exchange group represented by the small picture.
❷ The data exchange group represented by the small picture is not involved in data exchange.
❸ The number corresponds to a serial number in the data exchange table. It represents the serial number of the data exchange group represented by the small picture.
❹ The number corresponds to a slave station address in the data exchange table. It represents the slave station address which belongs to the data exchange group represented by the small picture.

Besides, the PLC Link error flags in an AH500 series CPU module are slightly different from the PLC Link error flags in a DVP series PLC, and therefore the small picture representing an AH500 series CPU module is different from the small picture representing a DVP series PLC. Please refer to the following table for more information.

Master station	Small picture	Description
AH500 series CPU module		❶ If an error occurs when data in a slave station is read, the indicator will be ON. ❷ If an error occurs when data is written into a slave station, the indicator will be ON. ❸ When data exchange is performed, the indicator will be ON.
DVP series PLC		❶ If an error occurs when data in a slave station is read, or an error occurs when data is written into a slave station, the indicator will be ON. ❷ When data exchange is performed, the indicator will be ON.

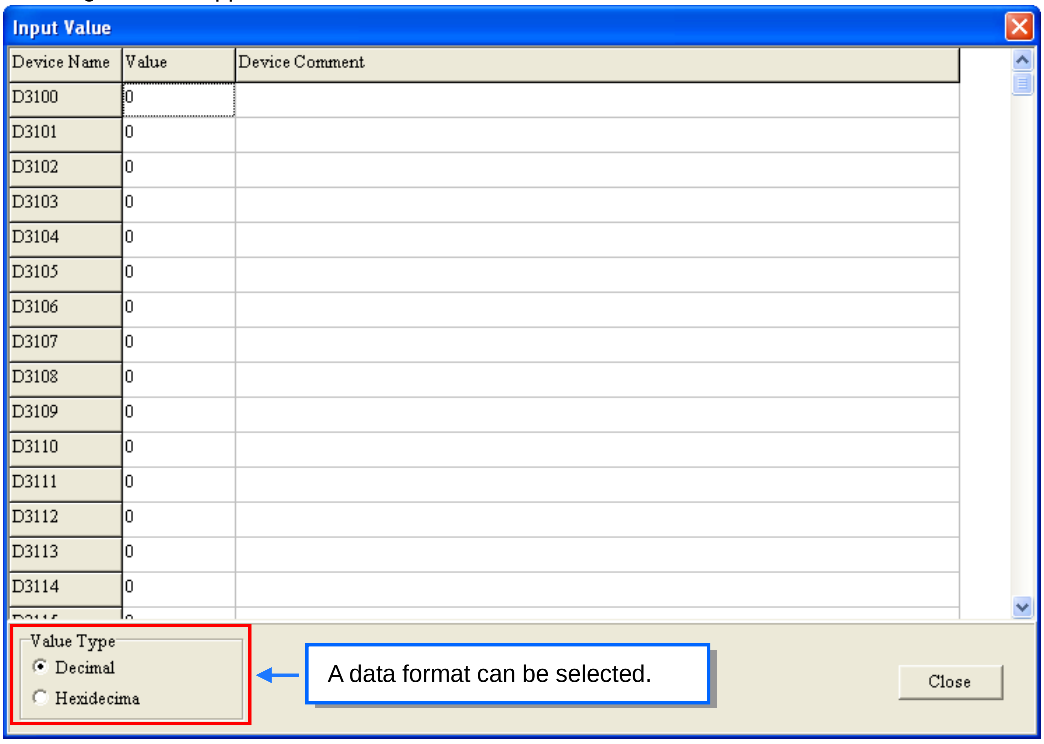
After the users select a small picture, and right-click the small picture, they can click **Write Register** or **Read Register** on the context menu.



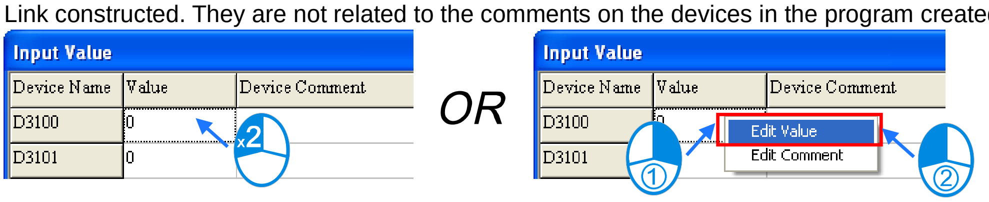
- **Write Register**: The data written into the slave station specified is stored in registers in the master station. For example, D3100~D3149 in the figure below are write registers.
- **Read Register**: The data **read** from the slave station specified is stored in registers in the master station. For example, D3000~D3099 in the figure below are read registers.

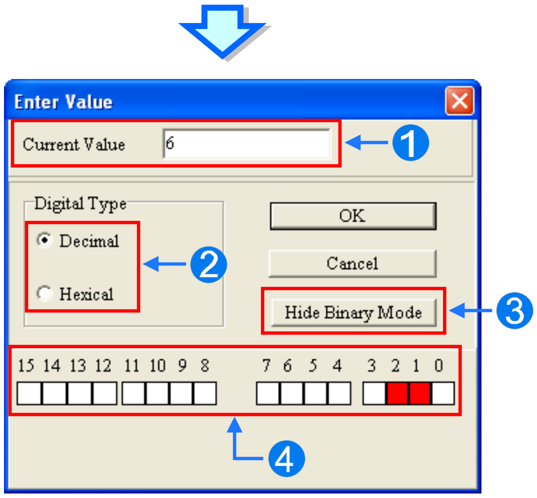
#	Station Addr.	R/W	Master Device Data	<=>	Slave Device Data	Length	Status	Device Type
1	2	R	D3000~D3099	<=	D2500~D2599	100	Enabled	SV
		W	D3100~D3149	=>	D2600~D2649	50		

After the users click **Write Register** or **Read Register** on the context menu, a correponding register monitoring table will appear.



If the users double-click the **Value** cell for a device, or click **Edit Value** on the context menu after they right-click the **Value** cell, they can type a value in the **Enter Value** window. If the users double-click the **Device Comment** cell for a device, or click **Edit Comment** on the context menu after they right-click the **Device Comment** cell, they can make a comment on the device. The comments made are for the PLC Link constructed. They are not related to the comments on the devices in the program created in ISPSoft.

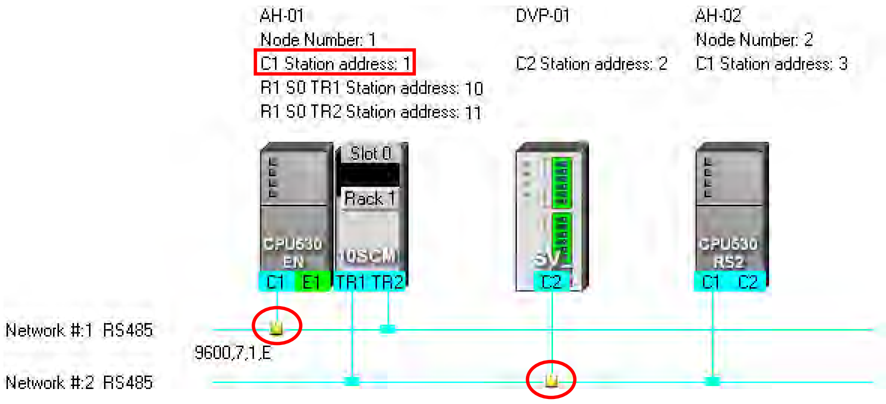




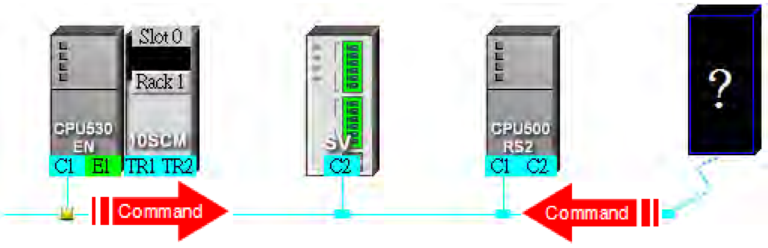
❶ Users can type a value in the box.
❷ Users can select a data format.
❸ Users can display or hide the binary mode.
❹ In the binary mode, users can set the states of the bits through the mouse.

11.1.2.6 Important Points About Constructing a PLC Link

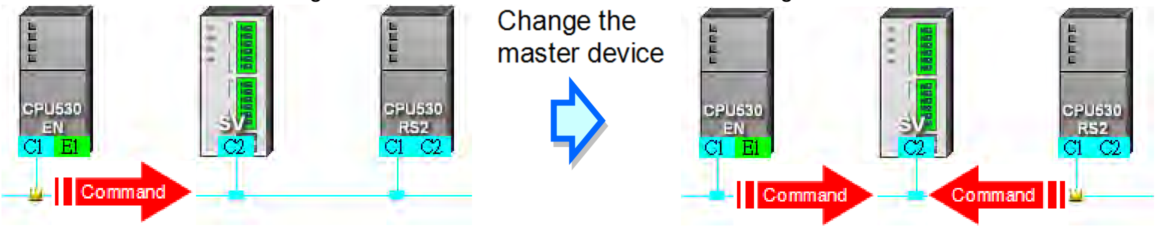
There is only one master station in an RS-485 network. If the node designated as a master station has several serial ports, the node can not be designated as a master station in another RS-485 network, but can be designated as a slave station in another RS-485 network. In the figure below, C1 on the node AH-01 is designated as a master station in network #1, and TR1 on the node AH-01 is designated as a slave station in network #2. Besides, C1 on AH-01 and TR2 on AH-01 are connected to network #1. The station addresses assigned to these two ports are different. As a result, TR2 is allowed to be designated as a slaved station in network #1.



When a PLC Link is executed, the master station sends reading/writing commands to the slave stations according to the data exchange table created. Another master station which can send commands is not allowed to exist. If there is an unknown device which does not appear in NWCONFIG and which can send commands in an RS-485 network, or there is a device which is designated as a slave station and which can send reading/writing commands in an RS-485 network, an error occurs when more than one device sends commands. As a result, after users create a network in NWCONIFG, they have to make sure that the actual connection is consistent with the network created in NWCONFIG.



Besides, if the users do not set the parameters related to a PLC Link in the original master station again before they designate another device as a master station, an error occurs when more than one device sends reading/writing commands. As a result, if the users want to designate another device as a master station, they have to make sure that the original master station does not execute the original PLC Link.



*** In addition to the conditions mentioned above, users have to prevent two devices or more than two devices from sending reading/writing commands simultaneously in any conditions.**

11.1.3 Executing a PLC Link through the Program in ISPSoft

Users can execute a PLC Link through the program in ISPSoft. The setting of the parameters related to a PLC Links is described in this section. Users can execute a PLC Link efficiently.

11.1.3.1 Parameters Related to a PLC Link

1. The special data registers and the special auxiliary relays for slave 1~slave 32 are described below.

	Master station						
	Slave station 1		**Slave station 2**		**...**	**Slave station 32**	
	Read	**Write**	**Read**	**Write**	**...**	**Read**	**Write**
Latched area	Address in the master: The device address into which the data is read (SR1404 and SR1405)	Address in the master: The device address from which the data is written (SR1468 and SR1469)	Address in the master: The device address into which the data is read (SR1406 and SR1407)	Address in the master: The device address from which the data is written (SR1470 and SR1471)	...	Address in the master: The device address into which the data is read (SR1466 and SR1467)	Address in the master: The device address from which the data is written (SR1530 and SR1531)
	Address in the slave: The device address from which the data is read (SR1532 and SR1533)	Address in the slave: The device address into which the data is written (SR1596 and SR1597)	Address in the slave: The device address from which the data is read (SR1534 and SR1535)	Address in the slave: The device address into which the data is written (SR1598 and SR1599)	...	Address in the slave: The device address from which the data is read (SR1594 and SR1595)	Address in the slave: The device address into which the data is written (SR1658 and SR1659)
	Number of data which is read from the slave (SR1660)	Number of data which is written into the slave (SR1692)	Number of data which is read from the slave (SR1661)	Number of data which is written into the slave (SR1693)	...	Number of data which is read from the slave (SR1691)	Number of data which is written into the slave (SR1723)
	Device type (SR1340)	Device type (SR1372)	Device type (SR1341)	Device type (SR1373)	...	Device type (SR1371)	Device type (SR1403)
	Type of slave 1 (SR1724)		Type of slave 2 (SR1725)		...	Type of slave 32 (SR1755)	
	Address of slave 1 (SR1756)		Address of slave 2 (SR1757)		...	Address of slave 32 (SR1787)	
	PLC Link flag (SM1392)		PLC Link flag (SM1393)		...	PLC Link flag (SM1423)	
Non-latched area	Data exchange flag (SM1424)		Data exchange flag (SM1425)		...	Data exchange flag (SM1455)	
	Read error flag (SM1456)	Write error flag (SM1488)	Read error flag (SM1457)	Write error flag (SM1489)	...	Read error flag (SM1487)	Write error flag (SM1519)
	The data reading is complete. (ON->OFF) (SM1520)		The data reading is complete. (ON->OFF) (SM1521)		...	The data reading is complete. (ON->OFF) (SM1551)	
	The data writing in the PLC Link is complete. (ON->OFF) (SM1552)		The data writing in the PLC Link is complete. (ON->OFF) (SM1553)		...	The data writing in the PLC Link is complete. (ON->OFF) (SM1583)	

***. SM1424~SM1583 are read-only devices.**

- Start address in the master station: The start address in the master station is a device address. The default start address in the master station is D0. If the AH500 Modbus communication protocol is used, the start address in the master station is an AH500 Modbus device address. If the standard Modbus communication protocol is used, the start address in the master station is a Modbus device address. The data in the device addresses in the master station starting from the start address in the master station is sent to a slave, and the data sent by a slave station is stored in the devices in the master station starting from the start address in the master station. If the communication protocol used is the standard Modbus communication protocol, only M0~M8191 and D0~D32767 can be used. If the communication protocol used is the AH500 Modbus communication protocol, only M0~M8191, D0~D65535, and L0~L65535 can be used.

- Start address in a slave station: The start address in a slave station is a device address. The default start address in a slave station is 0. The data in the device addresses in a slave station starting from the start address in the slave station is read, and the data sent by the master station is stored in the device addresses in a slave station starting from the start address in the slave station. If the communication protocol used is the standard Modbus communication protocol, only M0~M8191 and D0~D32767 can be used. If the communication protocol used is the AH500 communication protocol, only M0~M8191, D0~D65535, and L0~L65535 can be used. If a slave station is not an AH500 CPU module, the start address in the slave station must be an absolute address, e.g. 16#1000.
- Number of data read from a slave station: The default value is 0. If the devices used are registers, the unit of data length is a word. If the devices used are contacts, the unit of data length is a bit.
- Number of data written into a slave station: The default value is 0. If the devices used are registers, the unit of data length is a word. If the devices used are contacts, the unit of data length is a bit.
- An AH500 series CPU module can modify the data length automatically. If data length is larger than 450/100 (the AH500 communication protocol/the standard Modbus protocol) words, it will be modified automatically and become 450/100 words. If data length is larger than 7200/1600 (the AH500 communication protocol/the standard Modbus protocol) bits, it will be modified automatically and become 7200/1600 bits.
- A DVP series PLC can modify the data length automatically. If data length is larger than 100 words, it will be modified automatically and become 100 words. If data length is larger than 1600 bits, it will be modified automatically and become 1600 bits.
- Slave station type: The models which can be connected to the master station can be AH500 series CPU modules, DVP series PLCs, and other models. (The default value is 0.)
- After a CPU module is restored to the factory setting, the slave station address will become the default value. (The address of the 1st slave station will be 1, the address of the 2nd slave station will be 2, and the address of the 32th slave station will be 32.) If a PLC Link is executed, and SM1595 is ON, the slave station addresses in SR1756~SR1787 will be read. If a PLC Link is executed, and SM1595 is OFF, the slave station address in SR1756 will be read. A slave station address must be in the range of 1 to 216. If a slave station address is not in the range, it will become 1.
- Device type: The device type used by a slave station must be the same as the device type used by the master station. For example, if a slave station uses contact devices, the master station must use contact devices. The legal setting values are 0 (registers) and 1 (contacts). Other values are illegal values. If the value set is illegal, the slave station will not be involved in a data exchanged. The device type used for reading in a slave station can be set by means of SR1340, and the device type used for writing in a slave station can be set by by means of SR1372. (The default values in SR1340 and SR1372 are 0. (If the reading of data and the writing of data are synchronous, the device type used for reading must be the same as the device type used for writing.))

Additional remark:

A PLC Link can be executed only if the AH500 series CPU modules runs. If the number of data read from a slave station and the number of data written into a slave station are 0, no data exchange is performed. If a PLC Link is executed, the parameters related to the PLC link can not be modified. That is, a slave station can not be deleted or added if a PLC Link is executed. Only serial ports can be used as communication interfaces for data exchange performed by means of a PLC Link. (If an AH500 series CPU module used is AHCPU530-RS2, COM1 must be used for data exchange.)

2. Descriptions of flags:
   - PLC Link flag: The state of a PLC Link flag indicates whether the corresponding slave station is connected to the master station. If SM1585 is ON, users can decide whether to connect a slave station to the master station.
   - Data exchange flag: The state of a data exchange flag indicates whether the corresponding slave station and the master station exchange data with each other.
   - Read error flag: If an error occurs when the master station reads data from a slave station, the corresponding read error flag will be ON. For example, if the command sent form a slave station is incorrect, or the checksum in the command sent form a slave station is incorrect, the corresponding read error flag will be ON.
   - Write error flag: If an error occurs when the master station writes data into a slave station, the corresponding write error flag will be ON. For example, if the number of data written into a slave station is incorrect (is not in a device range), the write error flag will be ON.

- Completion of reading: The master station finishes reading data form a slave station
- Completion of writing: The master station finishes writing data into a slave station.

Additional remark:

If the reading of data and the writing of data are synchronous, the related flags will be controlled in the ways described below.

	Read error	Write error	Completion of reading	Completion of writing
The master station stops reading data and writing data simultaneously, or the master station is reading data and writing data simultaneously.	OFF	OFF	OFF	OFF
The master station finishes reading data and writing data simultaneously.	OFF	OFF	ON	ON
Timeout	ON	ON	OFF	OFF
The master station can not produce a packet which will be sent.	ON	ON	OFF	OFF
The data sent by a slave station can not be stored in the master station.	ON	OFF	OFF	ON

3. Description of the setting of the parameters related to a PLC Link:
   The setting of the parameters related to a PLC Link is described below. (Suppose the master station and slave station 1 are AHCPU530-EN.) The data in the device addresses starting from D100 in slave station 1 is read into the device address starting from D9 in the master station. The number of data read from slave station 1 is 10. The data in the device addresses starting from Y0.0 in the master station is written into the device addresses starting from Y2.0 in slave station 1. The number of written into slave station 1 is 5. The slave station type is AHCPU530-EN (16#E001). The slave station address is 16#0001.

Item	Reading/Writing	Device code	Value
Start address in the master station	Reading	SR1404	16#0000
		SR1405	16#0009
	Writing	SR1468	16#0000
		SR1469	16#A000
Start address in slave station 1	Reading	SR1532	16#0000
		SR1533	16#0064
	Writing	SR1596	16#0000
		SR1597	16#A020
Number of data read from slave station 1	Reading	SR1660	16#000A
Number of data written into slave station 1	Writing	SR1692	16#0005
Slave station type	Reading	SR1724	16#E001
	Writing		
Slave station address	Reading	SR1756	16#0001
	Writing		
Device type	Reading	SR1340	16#0000
	Writing	SR1372	16#0001

Additional remark:

There are a variety of Delta PLCs. Users can construct a PLC Link by connecting AH500 series CPU modules to DVP series PLCs, and other models. Consequently, there are limitations on the devices which can be used, the data exchange which can be performed, and the number of data which can be exchanged.

➢ The limitation on data exchange performed by an AH500 series CPU module is described below.

Device	Device range	Maximum length of data which can be read/written
Relays	M0~M8191	450 registers/100 registers* 7200 contacts/1600 contacts*
Data register	D0~D65535	
Link register	L0~L65535	

***. Maximum length of data which can be read/written (Reading data and writing data synchronously)=Maximum length of data which can be read/written (Reading data and writing data asynchronously). A PLC which is not an AH500 series CPU module can read/write the data in 100 registers at most, and the data in 1600 contacts at most.**

➢ If an AH500 series CPU module is a master station, DVP series PLCs can function as slave stations. DVP series PLCs can read data and write data simultaneously.

Model	Device code	Maximum data register address which can be used	Maximum relay address which can be used	Communication port which supports RS-485	Maximum length of data which can be read/written (word)*	
					Reading and writing data synchronously	Reading and writing data asynchronously
ES	0x0000	D599	M999	COM2	100	100
EX	0x0001	D599	M999	COM2	100	100
SS	0x0002	D599	M999	COM2	100	100
EC	0x0003	D599	M999	COM2	100	100
EH	0x0004	D9999	M4095	COM2	100	100
SA	0x0006	D4999	M4095	COM2	100	100
SC	0x0007	D4999	M4095	COM2	100	100
SX	0x0008	D4999	M4095	COM2	100	100
SV	0x0009	D9999	M4095	COM2	100	100
EH2-L	0x000A	D9999	M4095	COM2	100	100
EH2	0x000B	D9999	M4095	COM2	100	100
ES2	0x000C	D9999	M4095	COM2 and COM3	50	100
EX2	0x000D	D9999	M4095	COM2 and COM3	50	100
SS2	0x000E	D4999	M4095	COM2	50	100
SX2	0x000F	D9999	M4095	COM2	50	100
SV2	0x0010	D11999	M4095	COM2	100	100
EH3-L	0x0011	D11999	M4095	COM2 and COM3	100	100
EH3	0x0012	D11999	M4095	COM2 and COM3	100	100
SA2	0x0013	D9999	M4095	COM2 and COM3	50	100
MC	0x0014	D9999	M4095	COM2	50	100
SE	0x0015	D11999	M4095	COM2 and COM3	50	100

***. DVP series PLCs can modify the data length automatically.**

➢ The rules of data exchange are described below.

Master station	Slave station	Communication	Data exchange	
			Master station <=> Slave station	
AH500 series CPU module	AH500 series CPU module	AH500 Modbus communication protocol	M, D, and L[*1]	M, D, and L[*1]
		Standard Modbus communication protocol	M[*2]	M[*2]
			D	D
	DVP series PLC	Standard Modbus communication protocol	M[*2]	M[*2]
			D	D
	Device which is neither an AH500 series CPU module nor a DVP series PLC	Standard Modbus communication protocol	M[*2]	H (contact)[*2]
			D	H (register)
DVP series PLC	AH500 series CPU module	Standard Modbus communication protocol	D	D
	DVP series PLC	Standard Modbus communication protocol	D	D
	Device which is neither an AH500 series CPU module nor a DVP series PLC	Standard Modbus communication protocol	D	H (register)

***1. If the AH500 Modbus communication protocol is used, users can use relays, data registers, and link registers.**

***2. If the standard Modbus communication protocol is used, devices which are not data registers can not be involved in synchronous data exchange.**

11.1.3.2 Setting a PLC Link

1. **The process of setting a PLC Link is described below.**

Step 1: Setting the parameters related to a PLC Link

Set the special data registers and the special auxiliary relays which are described in section 11.1.3.1.

Step 2: Assigning slave station addresses manually/automatically

If SM1595 is ON, users can assign station addresses to all the slave stations.
If SM1595 is OFF, users can assign a station address to slave station 1 (SR1756), and the system can assign the station addresses starting from the station address that users assign to slave station 1 to the other slave stations.

Step 3: Connecting to the slave stations manually/automatically

If SM1585 is ON, users can decide whether to connect a slave station to the master station by setting the PLC Link flag corresponding to the slave station. SM1392~SM1423 are PLC Link flags.
If SM1585 is OFF, the master station will connect to the slave stations to which station addresses are assigned.

Step 4: Reading data and writing data synchronously/Reading data and writing data asynchronously

Reading data and writing data synchronously: If SM1598 is ON, the master station will read data from a slave station, and write data into the slave station simultaneously.
Reading data and writing data asynchronously: If SM1598 is OFF, the master station will not read data from a slave station, and write data into the slave station simultaneously.

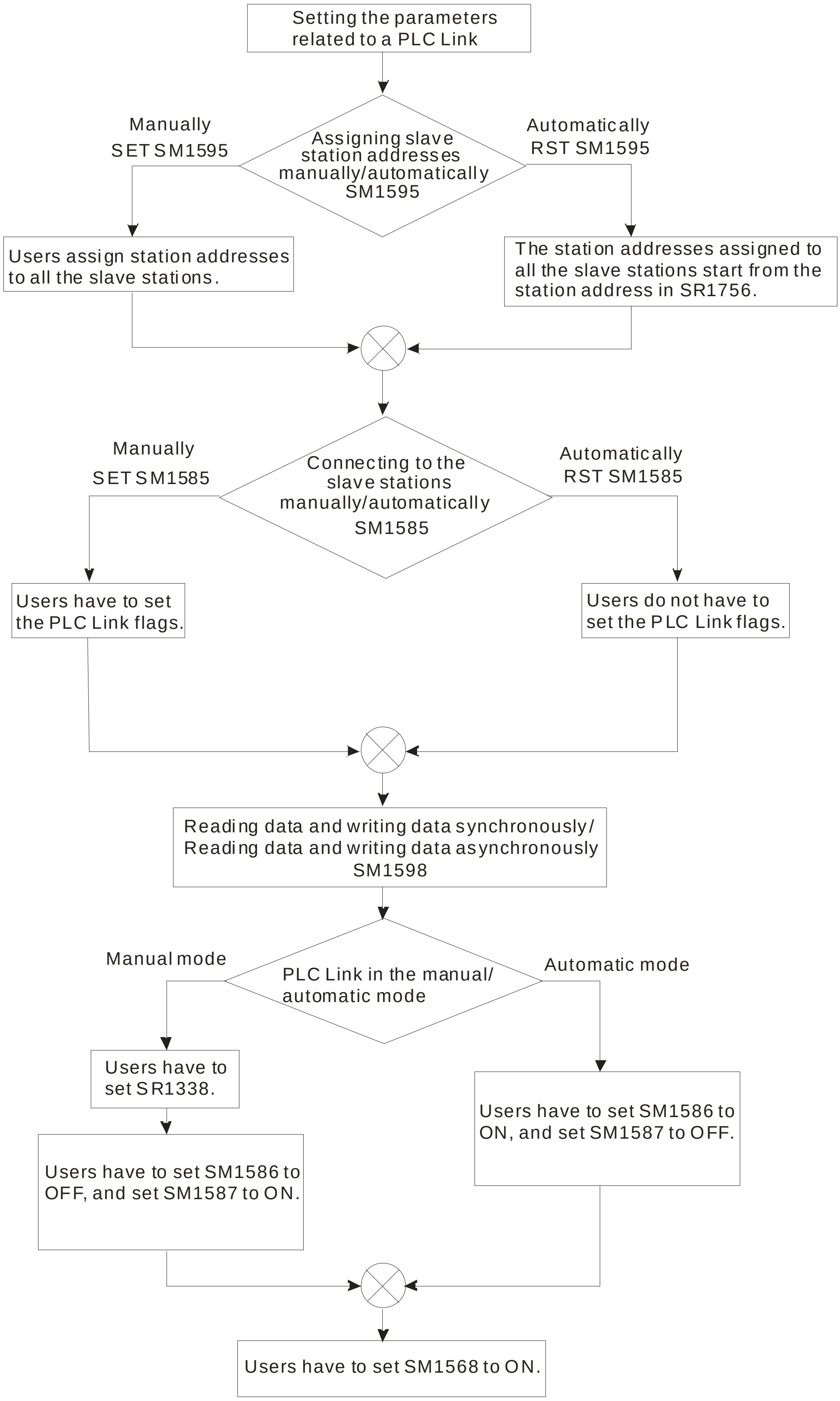
Step 5: PLC Link in the manual/automatic mode

PLC Link in the manual mode: Before users set SM1587 to ON, they have to set the number of times the master station exchanges data with all the slave stations (SR1338). The number of times the master station exchanges data with all the slave stations is displayed in SR1337. If the value in SR1338 is 0, SM1592 will be ON. The value in SR1338 can not be 0.
Users have to set SM1587 and SM1584 to ON first. If the value in SR1337 becomes the same as the value in SR1338, the execution of the PLC Link will stop, and SM1584 will become OFF. If the users want to execute the PLC Link in the manual mode again, they have to set SM1587 and SM1584 to ON again.
PLC Link in the automatic mode: After users set SM1586 and SM1584 to ON, the master station will exchange data with all the slave stations. The PLC Link will be executed until MS1584 or SM1586 becomes OFF.

Step 6: Enabling the function of executing a PLC Link

After the setting of all the parameters is complete, users can set SM1584 to ON.

Flowchart:


Setting the parameters related to a PLC Link
Manually
SET SM1595
Assigning slave station addresses manually/automatically SM1595
Automatically
RST SM1595
Users assign station addresses to all the slave stations.
The station addresses assigned to all the slave stations start from the station address in SR1756.
Manually
SET SM1585
Connecting to the slave stations manually/automatically SM1585
Automatically
RST SM1585
Users have to set the PLC Link flags.
Users do not have to set the PLC Link flags.
Reading data and writing data synchronously/ Reading data and writing data asynchronously SM1598
Manual mode
PLC Link in the manual/ automatic mode
Automatic mode
Users have to set SR1338.
Users have to set SM1586 to OFF, and set SM1587 to ON.
Users have to set SM1586 to ON, and set SM1587 to OFF.
Users have to set SM1568 to ON.

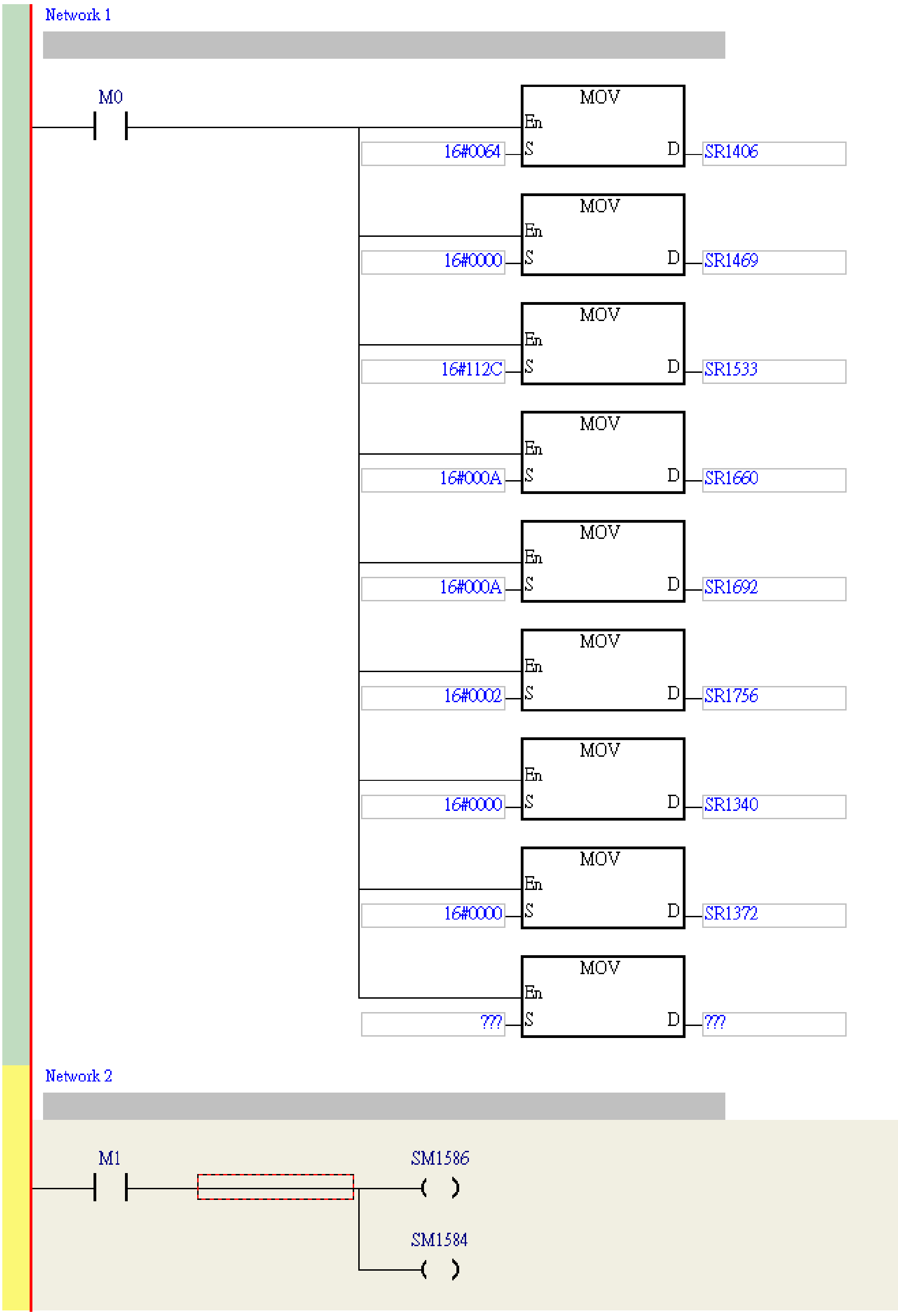
2. Example:

The master station AHCPU530-RS2 is connected to slave station 1 DVP28SV11T. The data in the device addresses starting from D300 in slave station 1 is read into the device address starting from D100 in the master station. The number of data read from slave station 1 is 10. The data in the device addresses starting from D0 in the master station is written into the device addresses starting from D300 in slave station 1. The number of written into slave station 1 is 10. SM1598 is set to OFF, SM1595 is set to OFF, and SM1586 is set to ON. Users can check whether data exchange is preformed correctly by comparing the data in D0~D9 with the data in D100~D109 in the master station.

Method 1:

Users can set the parameters related to a PLC Link according to the process described above.

Step 1: Start ISPSoft, and write the program shown below. If M1 is turned ON, SM1586 and SM1584 will be ON.



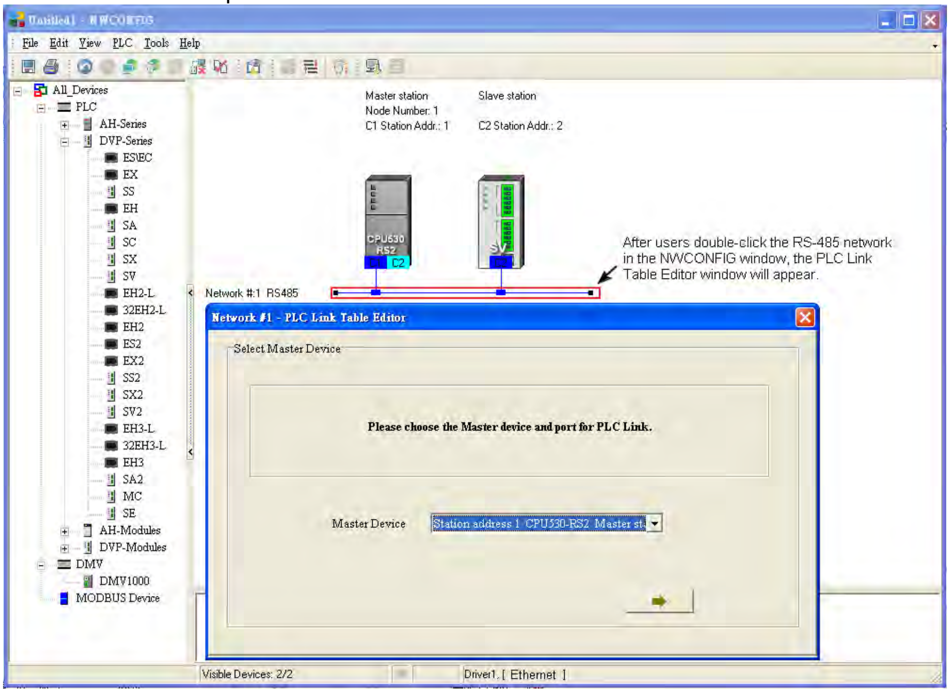
Step 2: Open the **Monitor Table** window in ISPSoft. Add M1, D0~D9, and D100~D109 to the window. Set M1 to ON, and then set values for D0~D9. Users can check whether data exchange is preformed correctly by comparing the data in D0~D9 with the data in D100~D109.

Device Name	Status	Data Type	Value (16 bits)
M1			
D0			11
D1			22
D2			33
D3			44
D4			55
D5			66
D6			77
D7			88
D8			99
D9			1010
D100			11
D101			22
D102			33
D103			44
D104			55
D105			66
D106			77
D107			88
D108			99
D109			1010

Method 2:

If users write a program, they will spend much time setting special data registers and special auxiliary relays. It is more convenient for users to construct a PLC Link by means of NWCONFIG in ISPSoft. (Please refer to section 11.1.2 for more information about NWCONFIG in ISPSoft.)

Step 1: After users double-click the RS-485 network in the **NWCONFIG** window, the **PLC Link Table Editor** window will appear. The users have to select **Station address 1 CPU530-RS2** in the **Master Device** drop-down list box.

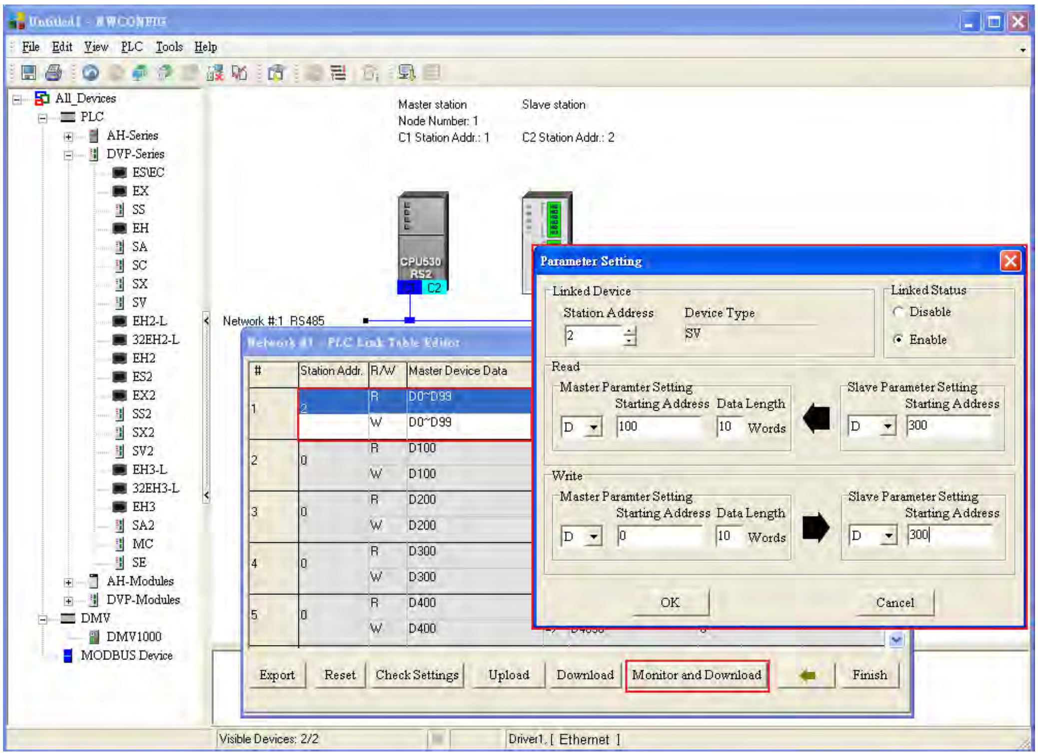


Step 2: The users have to click  until the system lead them to the third step.

A. After the users double-click 2 in the **Station Addr.** cell, the **Parameter Setting** window will appear.

B. In the **Master Parameter Setting** section in the **Read** section, the users have to select **D** in the drop-down list box, type **100** in the **Starting Address** box, and type **10** in the **Data Length** box. In the **Slave Parameter Setting** section in the **Read** section, the users have to select **D** in the drop-down list box, and type **300** in the **Starting Address** box. In the **Master Parameter Setting** section in the **Write** section, the users have to select **D** in the drop-down list box, type **0** in the **Starting Address** box, and type **10** in the **Data Length** box. In the **Slave Parameter Setting** section in the **Write** section, the users have to select **D** in the drop-down list box, and type **300** in the **Starting Address** box.

C. After the parameters in the **Parameter Setting** window are set, the users can click **OK** in the **Parameter Setting** window, and click **Monitor and Download** in the **PLC Link Table Editor** window.

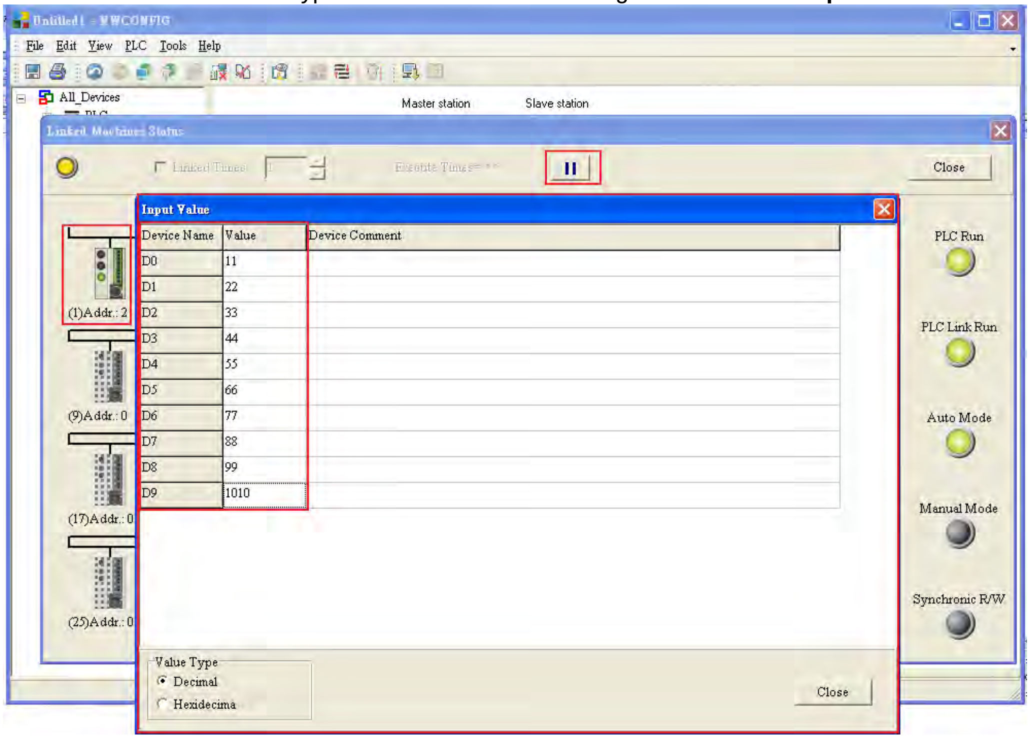


Step 3:

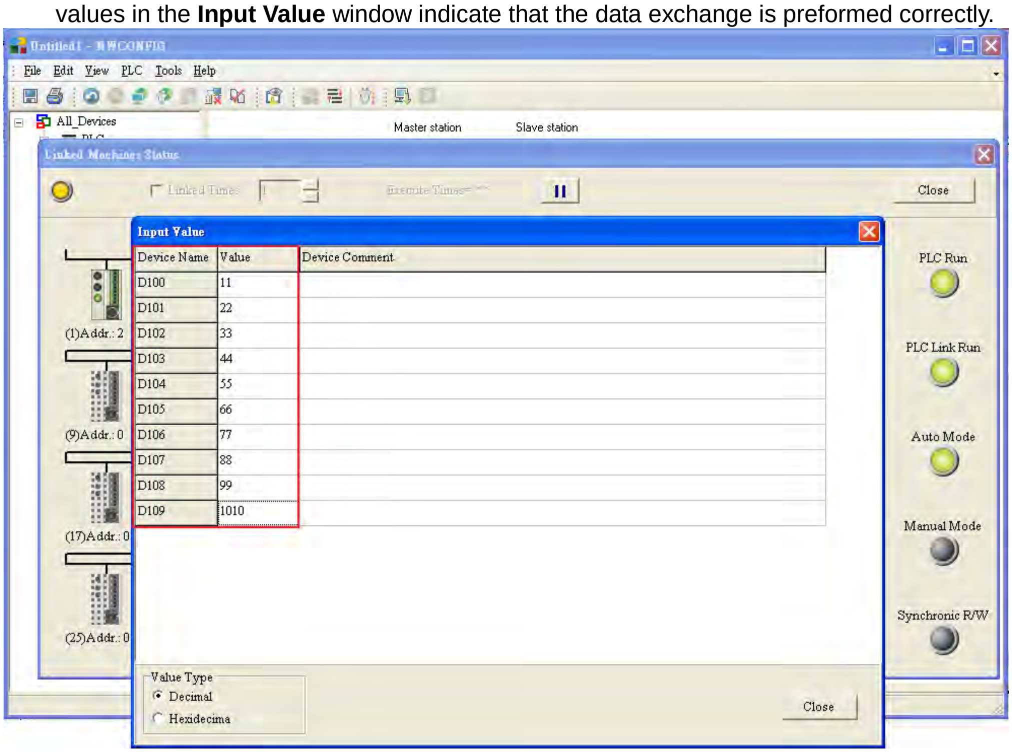
A. After the users click ▶ in the **Linked Machines Status** window, ▶ will become ⏸.

B. After the users right-click **(1) Addr,: 2**, they have to click **Write Register** on the context menu.

C. The users have to type the values shown in the figure below in the **Input Value** window.



Step 4: The users have to right-click **(1) Addr,: 2**, and click **Read Register** on the context menu. The values in the **Input Value** window indicate that the data exchange is preformed correctly.



11.1.4 Related Special Auxiliary Relays and Special Data Registers

1. Descriptions of the related special auxiliary relays:

Device	Name	R/W	Description
SM1584	Enabling the function of executing a PLC Link	R/W	Executing a PLC Link OFF: The function of executing a PLC Link is disabled. (Default) ON: The function of executing a PLC Link is enabled.
SM1585	Connecting to the slave stations automatically/manually	R/W	Using user-defined PLC Link flags *1 OFF: The user-defined PLC Link flags are not used. ON: The user-define PLC Link flags are used.
SM1586	Executing a PLC Link in the automatic mode	R/W	PLC Link in the automatic OFF: Not executing a PLC Link in the automatic mode (Default) ON: Executing a PLC Link in the automatic mode
SM1587	Executing a PLC Link in the manual mode	R/W	PLC Link in the manual mode OFF: Not executing a PLC Link in the manual mode (Default) ON: Executing a PLC Link in the manual mode
SM1588	Enabling the function of detecting the slave stations automatically	R	Detecting the slave stations OFF: The master does not detect the slaves. ON: The master station detects the slave stations.
SM1589	PLC Link error flag	R	If SM1586 and SM1587 are ON, SM1589 will be ON. OFF: No error occurs. ON: An error occurs.
SM1590	A device address is incorrect.	R	If a device address is incorrect, SM1590 will be ON. OFF: A device address is incorrect. ON: No device address is incorrect.
SM1591	Timeout	R	If there is a communication timeout, SM1591 will be ON. OFF: There is no communication timeout. ON: There is a communication timeout.
SM1592	The number of polling cycles in a PLC link is incorrect.	R	If the value in SR1338 is 0, SM1592 will be ON. OFF: The number of times the master station polls the slave station is correct. ON: The number of times the master station polls the slave stations is incorrect.
SM1593	Standard Modbus communication protocol/AH500 Modbus communication protocol	R/W	Selecting a communication protocol OFF: Standard Modbus communication protocol (Default) ON: AH500 Modbus communication protocol
SM1594	Detecting the slave stations automatically	R/W	The master station will detect the slave stations automatically only if the execution of the PLC Link stops. OFF: The master station finishes detecting the slave stations, or waits to detect the slave stations. (Default)

Device	Name	R/W	Description
			ON: The master station is detecting the slave stations.
SM1595	Assigning slave station addresses automatically/manually	R/W	OFF: The station addresses assigned to all the slave stations start from the station address in SR1756. (Default) ON: Users assign station addresses to all the slave stations.
SM1596	PLC Link error	R	If an error occurs when a PLC Link is executed, SM1596 will be ON. If no error occurs when a PLC Link is executed, SM1596 will be OFF. OFF: No error occurs. (Default) ON: An error occurs.
SM1597	Using an extension communication port	R/W	If SM1597 is ON, an extension communication port will be used to send a command. If SM1597 is OFF, a communication port on the master station is used to send a command. OFF: No extension communication port is used. (Default) ON: An extension communication port is used.
SM1598	Enabling the function of reading data and writing data synchronously	R/W	If SM1598 is ON, t If SM1598 is OFF, t OFF: The function of reading data and writing data synchronously is disabled. ON: The function of reading data and writing data synchronously is enabled.*2 。

***1. If the master station automatically detects that the station address of a slave station is the same as its station address, it will not connect to the slave station.**

***2. If the reading of data and the writing of data are synchronous, the device type used for reading must be the same as the device type used for writing. Otherwise an error will occur.**

2. Descriptions of the read-only devices SM1588~SM1592:

Device	Description
SM1588	When the master station detects the slave stations automatically, SM1588 is ON. When the master station finishes detecting the slave stations, SM1588 is OFF.
SM1589	If SM1586 and SM1587 are ON, SM1589 will be ON, and SM1584 will be OFF. If no error occurs when the PLC Link is executed again, SM1589 will become OFF automatically.
SM1590	If communication address error occurs when data exchange is performed, SM1590 will be ON. If no communication address error occurs when data exchange is performed, SM1590 will be OFF.
SM1591	If a timeout occurs when data exchange is performed, SM1591 will be ON. If no timeout occurs when data exchange is performed, SM1591 will be OFF.
SM1592	If the value in SR1338 is 0, SM1592 will be ON, and SM1587 will be OFF. If the value in SR1338 is a legal value when SM1587 is ON, or if the value in SR1338 is a legal value when SM1584 is ON, SM1592 will be OFF.

3. Descriptions of the special data registers SR1329~SR1338:

Device	Name	R/W	Description
SR1332	Remote backplane ID	R/W	The value in SR1332 indicates the remote backplane on which the RTU module used is installed. The value in SR1332 must be in the range of 1 to 8.
SR1333	Remote slot ID	R/W	The value in SR1333 indicates the remote slot in which the RTU module used is installed. The value in SR1333 must be in the range of 0 to 7.
SR1334	Extension communication port number	R/W	The value in SR1334 indicates the communication port used. The value in SR1334 must be 1 or 2.
SR1335	Cycle of a PLC Link	R	The value in SR1335 indicates the time it takes for the master station to detect all the slave stations. (Time unit: 1 millisecond) The value in SR1335 will be 0 if one of the following conditions occurs. 1. The master station is turned from OFF to ON. 2. The master station begins to runs, or stops running. 3. The master station finishes detecting all the slave stations for the first time. The value in SR1335 will remain unchanged if the function of enabling a PLC Link is disabled.
SR1336	Number of slave stations connected	R	Users can not set SR1336. The can only view the value in SR1336. Whenever a PLC Link is executed, the slave stations connected to the master station are count.
SR1337	Time for which data has been exchanged by means of a PLC link	R	The value in SR1337 indicates the number of times the master station exchanges data with all the slave stations. SR1337 can be used only if SM1587 is ON. If the execution of a PLC link stops, the value in SR1337 will not disappear. If the execution of a PLC link in the manual mode stops, the value in SR1337 will not disappear. If the value in SR1337 becomes the same as the value in SR1338, the execution of the PLC link in the manual mode will stop.
SR1338	Restricted time of the PLC link which is defined by users	R/W	Users can set the number of times the master station exchange data with all the slave stations. The value in SR1338 must be in the range of 1 to 65535. If the value in SR1338 is not in the range, it will not be changed automatically.

11.2 Ether Link (for AHCPU5X0 models)

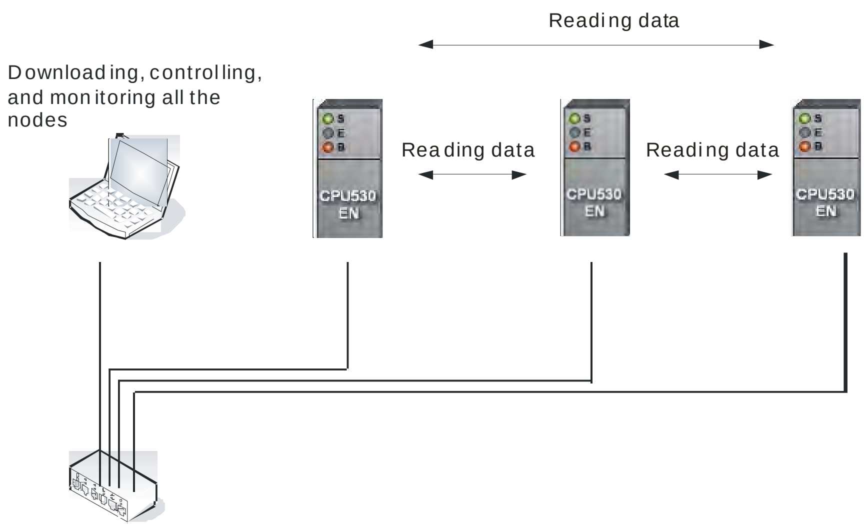
This function is applicable for AH500 basic CPU module series (AHCPU500/510/520/530).

11.2.1 Introduction of an Ether Link

An Ether Link is a network mechanism for data exchange performed through an Ethernet connection. If there are several nodes in an Ethernet network, users can create a mechanism for data exchange in the network, and select a start mode. If the parameters which are set are downloaded to the PLCs in the network, the systems of the PLCs perform data exchange according to the start mode selected when the PLCs run. The users do not have to write a redundant program. Besides, only AH500 series CPU modules support Ether Links.

A PLC Link is a master/slave model. There is only one master station in an RS-485 network, and the other stations which are slave stations passively receive reading/writing commands from the master station. Compared with a PLC Link, an Ether Link adopts a safer data request mechanism. It is the data demanding nodes in an Ethernet network that execute an Ether Link.

An Ether Link is not a master/slave model. It allows a node to send reading commands which ask for data to other nodes. The nodes will send the data to the node after they receive the reading commands. Owing to the fact that a node can not send writing commands to other nodes, the use of an Ether Link is safer than the use of a PLC Link. Besides, all the nodes in an Ethernet network can send reading commands through TCP/IP, and the system automatically manages the transmission of packets through TCP/IP. Compared with a PLC Link, an Ether Link is more efficient.

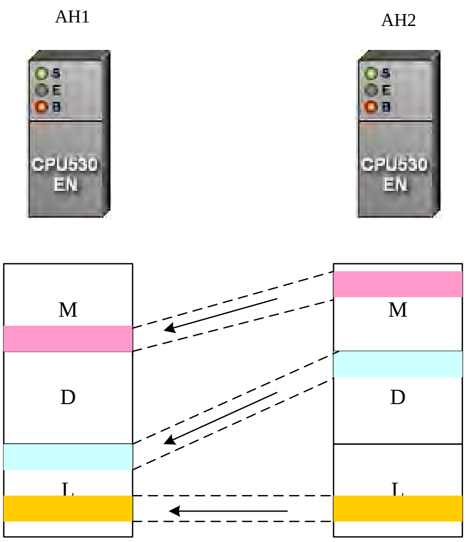


11.2.1.1 General Specifications and Functions

1. General specifications:

Item	Specifications
Communication type	Distribution
Data transfer rate	100 Mbps
Communication medium	Category 5 shielded cable
Maximum transfer distance	100 meters
Data storage	Relays (A word is taken as a unit.), data registers, and link registers
Number of storage blocks	Maximum of 128 blocks
Size of a storage block	Maximum of 1900 words
Modules supported	AHCPU530-EN, AH10EN-5A

2. Functions:
An Ether Link is a network mechanism through which PLCs can exchange data. If the PLCs in a network want to perform data exchange, they must be in the same domain. A PLC can read the data in relays, data registers, and link registers in another PLC, and store the data in relays, data registers, and link registers in itself. In the figure below, AH1 reads the data in three storage blocks in AH2. The maximum size of a storage block is 1900 words. (The maximum size of a storage block can not exceed the device range.) The number of storage blocks which are read in a PLC plus the number of storage blocks that the PLC reads is no more than 128.



- Flexible control
There are three start modes.
(1) **Always Run**: When the PLC runs, data exchange is performed.
(2) **Always Stop**: During the operation of the PLC, no data exchange is performed.
(3) **SM Flag**: The performance of data exchange depends on a special auxiliary relay in the PLC.
Users can set the start mode of an Ethernet port. They can operate an Ethernet port flexibly.
- Simple setting
Users can construct an Ether Link and a PLC Link by means of NWCONFIG in ISPSoft. After users create a network framework in NWCONFIG, they can create a data exchange table. Users can add devices and storage blocks which are involved in data exchange according to the actual framework. The setting can be downloaded to a PLC by the software. Users do not have to memorize registers.
- Elimination of errors
The execution of an Ether Link can be monitored by ISPSoft. Users can know the operating status of a PLC. The ports on a PLC and the storage blocks involved in data exchange are displayed. Besides, the error log displayed helps users eliminate errors.

11.2.1.2 Steps of Constructing an Ether Link

1. Plan a network architecture.
2. Connect PLCs to network cables according to the network architecture planned, and power the PLCs up.
3. Assign IP addresses and subnet masks to the Ethernet ports on the PLCs which will be involved in data exchange by means of HWCONFIG in ISPSoft. (The PLCs which will be involved in data exchange must be in the same domain.)
4. Create the network architecture planned in NWCONFIG in ISPSoft. Assign IP addresses and subnet masks to the machines which will be involved in data exchange. (Note: The IP addresses/subnet masks assigned in HWCONFIG and the IP addresses/subnet masks assigned in NWCONFIG must be the same. Otherwise an error will occur if the Ether Link constructed in NWCONFIG is executed.)
5. Create a data exchange table. (Please refer to section 11.2.2 for more information.)
6. Download the data exchange table, and monitor the execution of the Ether Link constructed in NWCONFIG.
7. The construction of an Ether Link is finished.

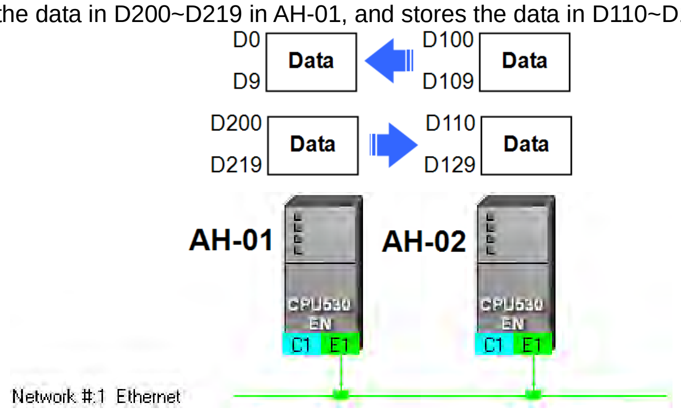
11.2.2 Constructing an Ether Link in NWCONFIG in ISPSoft

11.2.2.1 Constructing an Ether Link

Please refer to the example below for more information. If users want to create an Ether Link shown below, they have to create a data exchange table for the two data request nodes AH-01 and AH-02.

(a) AH-01 reads the data in D100~D109 in AH-02, and stores the data in D0~D9 in itself.

(b) AH-02 reads the data in D200~D219 in AH-01, and stores the data in D110~D129 in itself.



#	Device Name	Register	Starting Address	Range	<->	#	Device Na...	Register	Starting Address	Range	Size
1	AH-01	D	0	D0 ~ D9	<-	2	AH-02	D	100	D100 ~ D109	10
2	AH-02	D	110	D110 ~ D129	<-	1	AH-01	D	200	D200 ~ D219	20

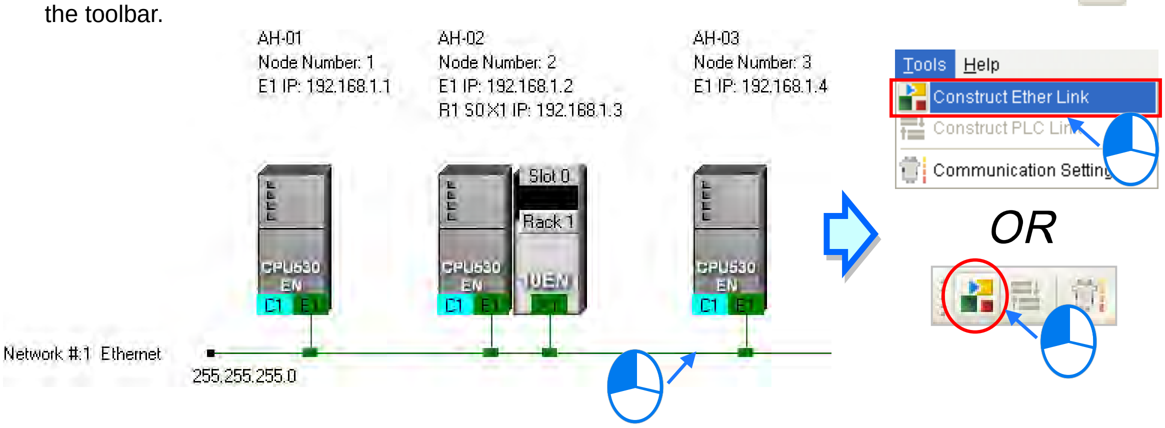
An Ether Link is based on a network. If a node is connected to several networks, users can set several groups of parameters related to Ether Links for the networks. As a result, there may be several groups of parameters related to Ether Links in a PLC. Owing to the fact that an Ether Link is not a master/slave model, each node in a network can be a data demanding node and a data supply node at the same time. In the first piece of data in the table above, AH-01 is a data requiring node, and AH-02 is a data providing node. In the second piece of data in the table above, AH-01 is a data providing node, and AH-02 is a data requiring node.

11.2.2.2 Opening the Ether Link Configuration Window

Before users construct an Ether Link, they have to make sure that a network is set correctly. There are three ways to open the **Ether Link Configuration** window.

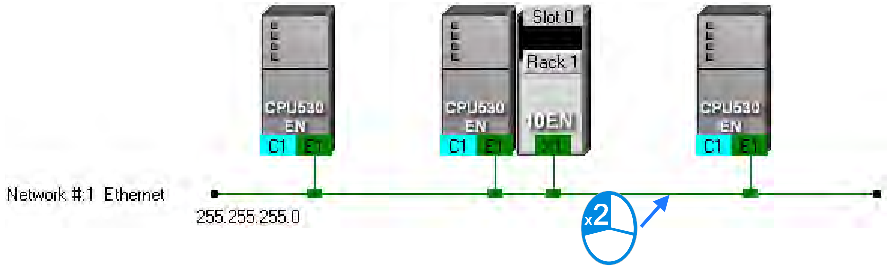
- **Method 1**

  After the users select a network, they have to click **Construct Ether Link** on the **Tools** menu, or  on the toolbar.



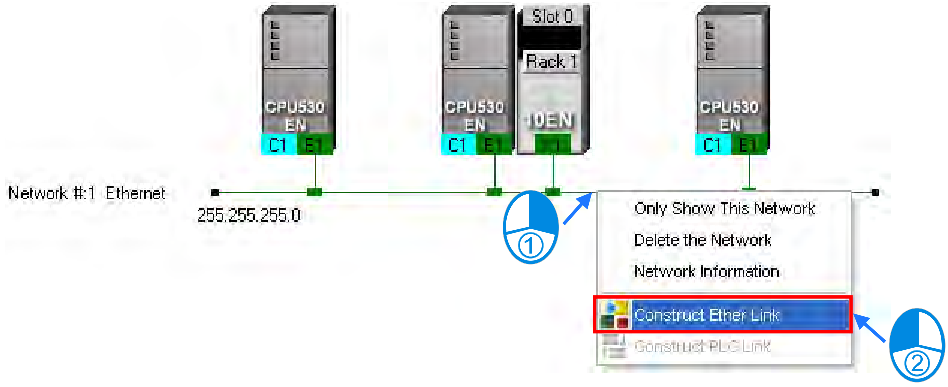
- **Method 2**

  Double-click a network.

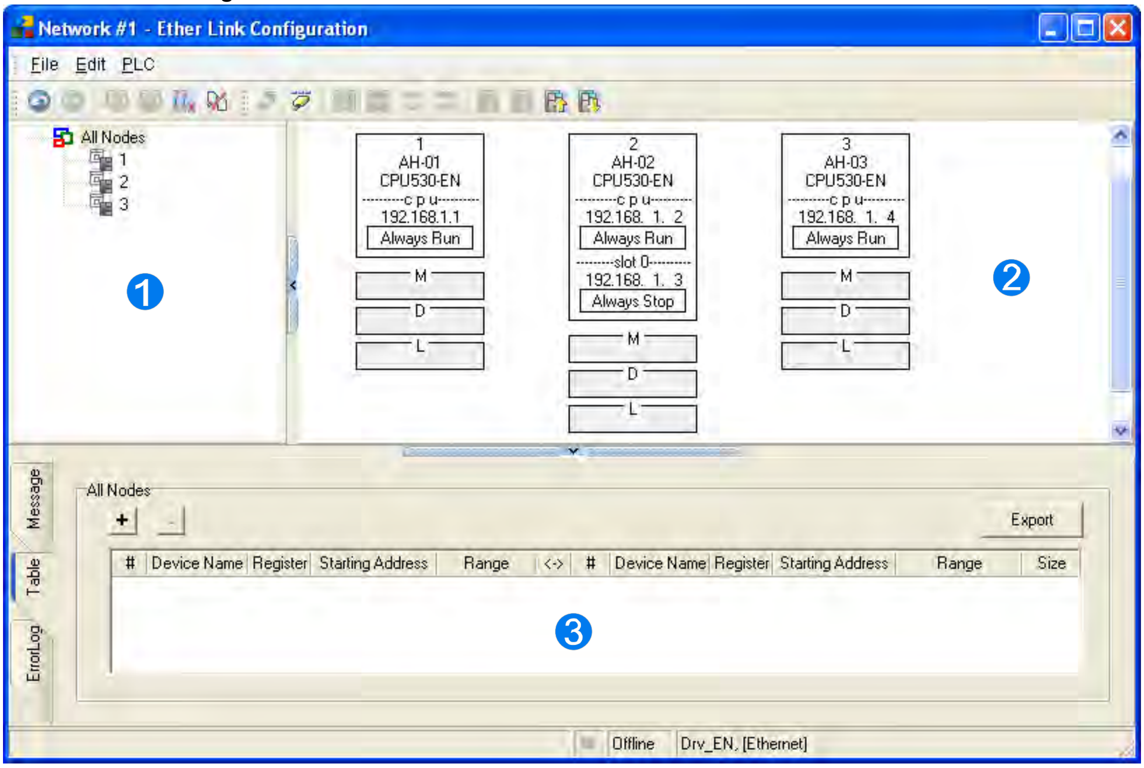


- **Method 3**

  Right-click a network, and then click **Construct Ether Link** on the context menu.



The **Ether Link Configuration** window is shown below.

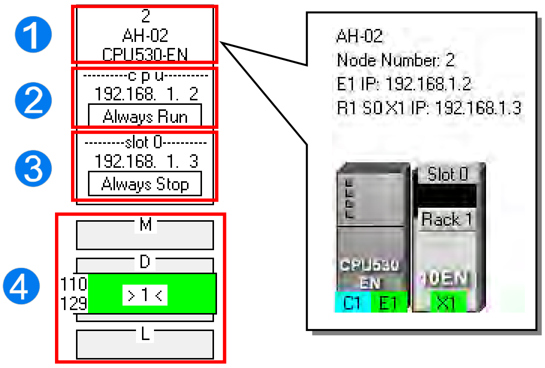


❶ **Node list**: After the users click a node, the node and the nodes of which the node demands data will be shown in the display area.

❷ **Display area**: The information about a node and the nodes of which the node demands data is displayed in this area.

❸ **Information area**: The users can click the **Message** tab, the **Table** tab, or the **Error Log** tab.

A node shown in the display area in the figure above is described below.



❶ The information is composed of a node number, a PLC name, and a model name.

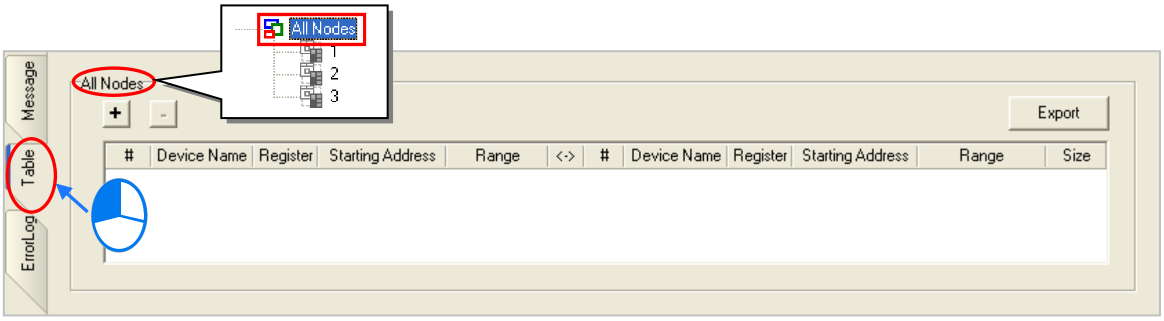
❷ The IP address assigned to AH500 series CPU module is 192.168.1.2. The start mode of the Ether Link constructed is **Always Run**.

❸ The IP address assigned to the module installed in slot 0 is 192.168.1.3. The start mode of the Ether Link constructed is **Always Stop**.

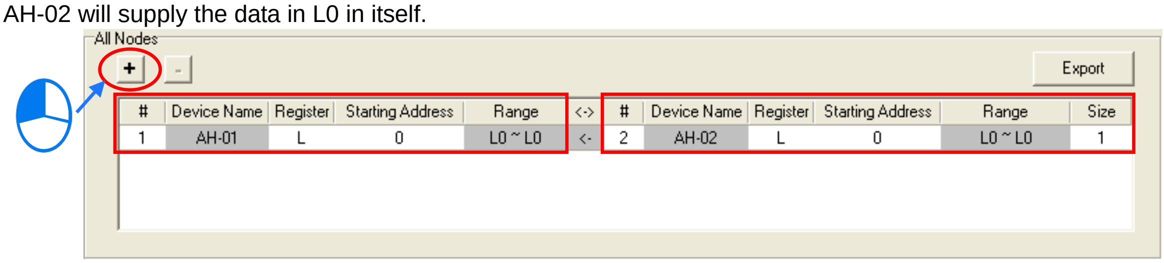
❹ >1< in the D block indicates that the D block demands data of node 1. The numbers at the left side of the D block indicate that the data demanded of node 1 will be stored in D110~D119 in node 2. The color assigned to the D block depends on the node number in the D block. Owing to the fact that there is not any information in the M block and the L block, the M block and the L block does not demand any data of other devices.

11.2.2.3 Creating and Managing a Data Exchange Table

If users want to create a data exchange table, they have to click the **Table** tab in the information area. The node which is selected on the node list is shown in the upper left corner of the information area. The data in the table is related to the node selected.

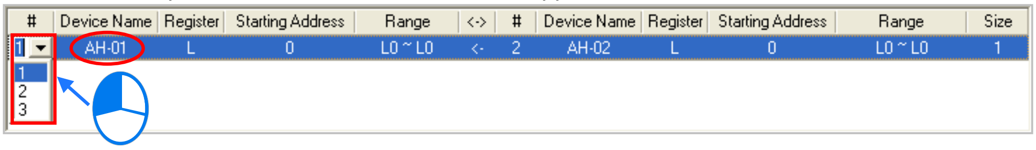


If the users click +, a new piece of data will be added to the table. A piece of data is composed of two parts. The left part of the data in the figure below indicates that the data demanding node AH-01 will store the data demanded in L0 in itself, and the right part of the data in the figure below indicates that the data supply node AH-02 will supply the data in L0 in itself.

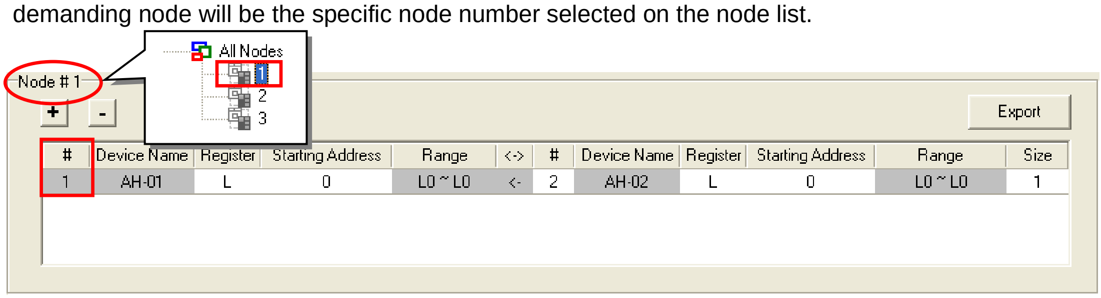


The steps of setting a data exchange group are as follows.

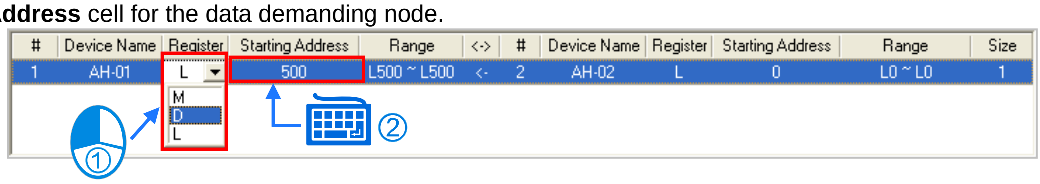
(1) Select a node number in the # cell for the data demanding node. After the users select a node number, the PLC name corresponds to the node number will be appear in the **Device Name** cell for the node number.



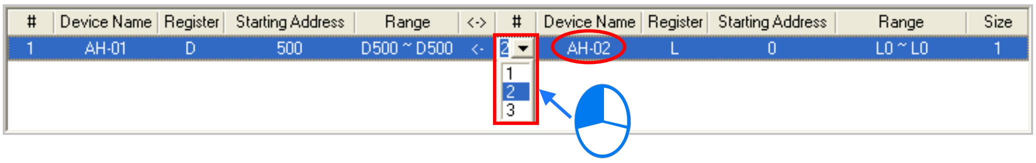
If the users select a specific node number rather than **All Nodes** on the node list, the data in the table will be related to the specific node number selected, and the fixed node number in the # cell for the data demanding node will be the specific node number selected on the node list.



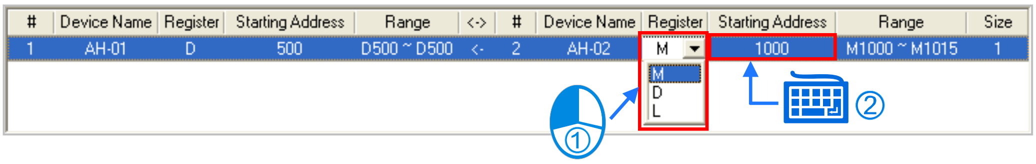
(2) Select a device type in the **Register** cell for the data demanding node, and type an address in the **Starting Address** cell for the data demanding node.



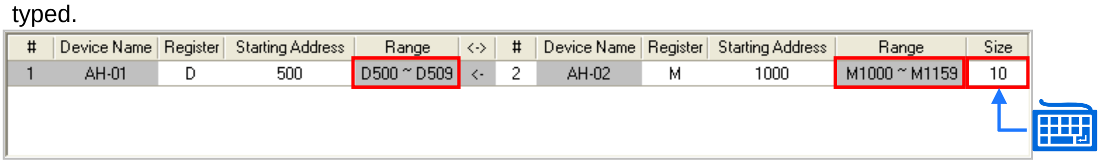
(3) Select a node number in the # cell for the data supply node. The node number in the # cell for the data demanding node can not be the same as the node number in the # cell for the data supply node. After the users select a node number, the PLC name corresponds to the node number will be appear in the **Device Name** cell for the node number.



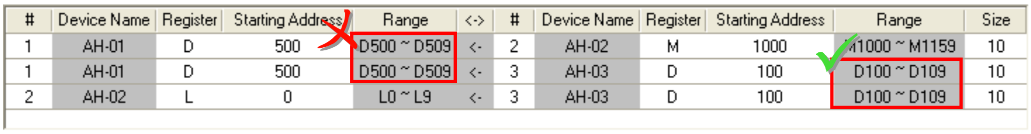
(4) Select a device type in the **Register** cell for the data supply node, and type an address in the **Starting Address** cell for the data supply node. The device type selected in the **Register** cell for the data supply node does not have to be the same as the device type selected in the **Register** cell for the data demanding node.



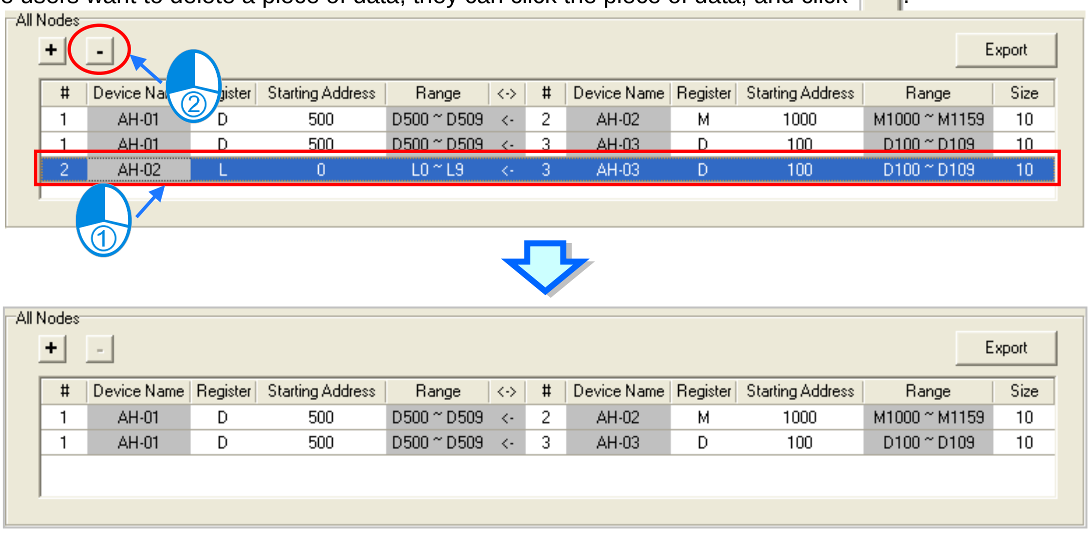
(5) Type a data length in the **Size** cell. A word is a unit. The maximum data length is 1900 words. After the users type a data length, the device ranges in the **Range** cells will change according to the data length typed.



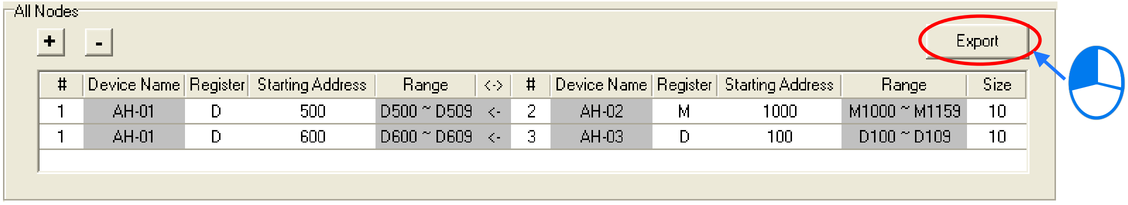
The users can create data exchange groups by following the steps described above. The device range in the **Range** cell for a data demanding node can not overlap the device range in the **Range** cell for another data demanding node whereas the device range in the **Range** cell for a data supply node can overlap the device range in the **Range** cell for another data supply node. In other words, different demanders can ask for the same data, but different data can not be store in the same block.



If the users want to delete a piece of data, they can click the piece of data, and click - .

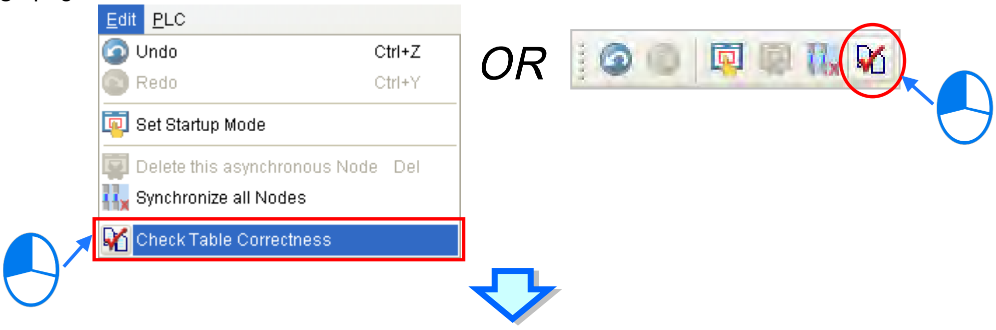


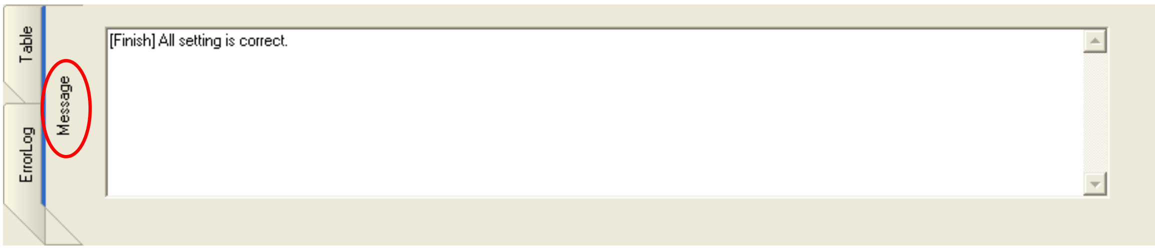
After the users click **Export**, the data in the data exchange table can be exported as a CSV file. The users can edit the CSV file through Microsoft Excel. The CSV file can also be used as reference material for another development work.



#	Device Name	Register	Starting Address	Range	<->	#	Device Name	Register	Starting Address	Range	Size
1	AH-01	D	500	D500 ~ D509	<-	2	AH-02	M	1000	M1000 ~ M1159	10
1	AH-01	D	600	D600 ~ D609	<-	3	AH-03	D	100	D100 ~ D109	10

After the users create a data exchange table, they can click **Check Table Correctness** on the **Edit** menu or on the toolbar if they wan to check the data set in the table. The check result will be displayed in the **Message** page.

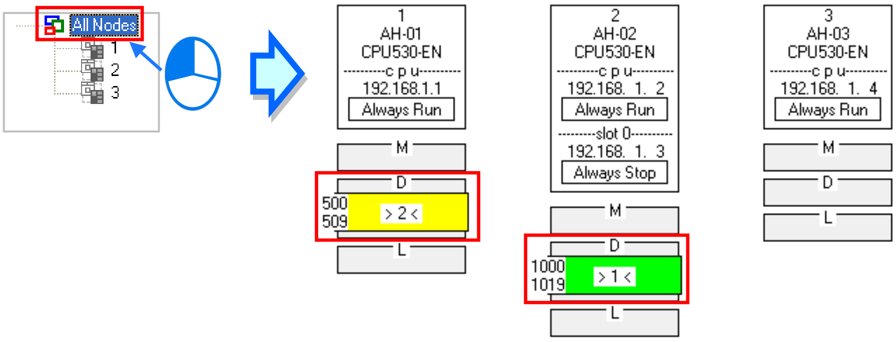




11.2.2.4 Node List and Display Area

If users click **All Nodes** on the node list, all the nodes will be displayed in the display area, and all the data exchange groups set will be in the data exchange table under the display area. Besides, the devices in which the data demanded will be stored, and the data supply nodes are indicated in device blocks of the nodes in the display area.

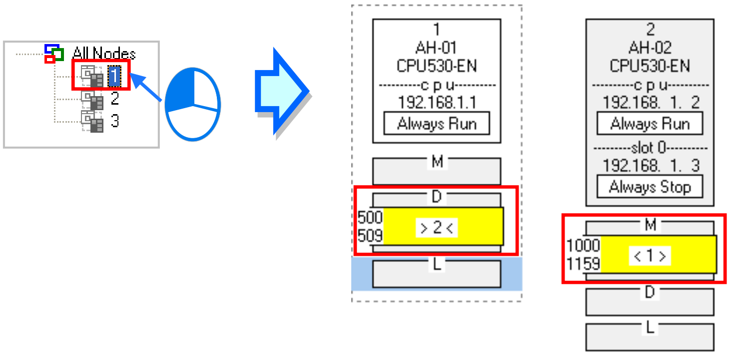
>2< in the D block in node 1 indicates that the D block demands data of node 2, and the numbers at the left side of the D block indicate that the data demanded of node 2 will be stored in D500~D509 in node 1. Likewise, >1< in the D block in node 2 indicates that the D block demands data of node 1, and the numbers at the left side of the D block indicate that the data demanded of node 1 will be stored in D1000~D1019 in node 1.



#	Device Name	Register	Starting Address	Range	<->	#	Device Name	Register	Starting Address	Range	Size
1	AH-01	D	500	D500 ~ D509	<-	2	AH-02	M	1000	M1000 ~ M1159	10
2	AH-02	D	1000	D1000 ~ D1019	<-	1	AH-01	L	0	L0 ~ L19	20

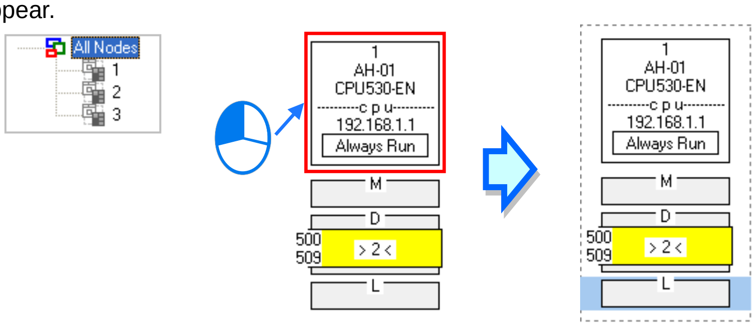
If the users click a specific node on the node list, the node and the nodes of which the node demands data will be shown in the display area, and the data in the data exchange table under the display will be related to the specific node selected.

In the figure below, the dotted frame indicates that node 1 on the node list is selected, and the gray ground indicates that node 2 is a data supply node. Node 2 can not be selected, and the information in the M block in node 2 indicates the data which will be supplied to node 1. Owing to the fact that node 3 does not supply any data to node 1, node 3 is not displayed in the display area.
The numbers at the left side of the D block in node 1 indicates that the data demanded of node 2 will be stored in D500~D509 in node 1. <1> in the M block in node 2 indicates that the data in M1000~M1129 in node 2 will be supplied to 1.

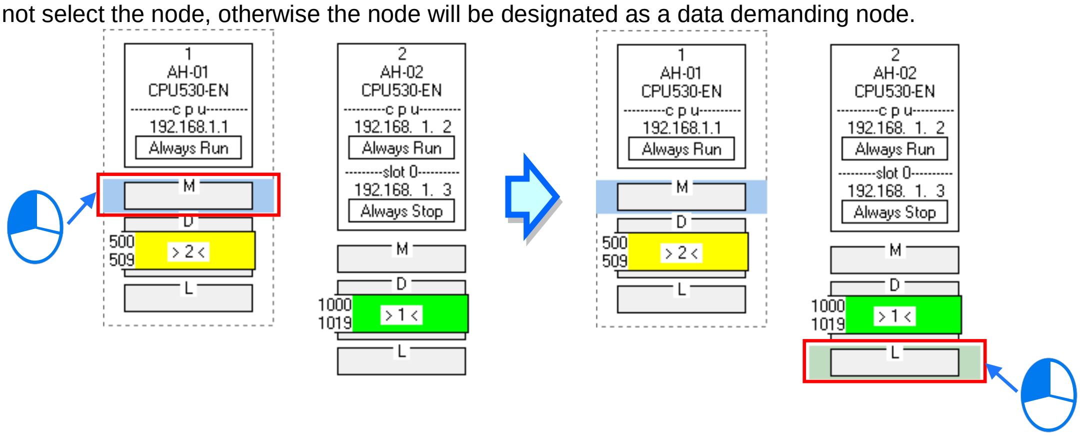


#	Device Name	Register	Starting Address	Range	<->	#	Device Name	Register	Starting Address	Range	Size
1	AH-01	D	500	D500 ~ D509	<-	2	AH-02	M	1000	M1000 ~ M1159	10

If a specific node on the node list is selected, the node in the display area will be selected. After the users select **All Nodes** on the node list, they can click the information about a node in the display area if they want to select the node. If the users click a device block in a node, the node will not be selected. After a node is selected, a dotted frame will appear.



Once a node is selected, the node will be designated as a data demanding node. After the users click a device block in the node selected, a blue cursor will appear. After the users click a device block in another node (a data supply node), a green cursor will appear. The users can only click a device block in a data supply node. They can not select the node, otherwise the node will be designated as a data demanding node.



The users can click + to add a new piece of data to the data exchange table. The data includes the data demanding node, the node number assigned to the data demanding node, the data supply node, the node number assigned to the data supply node, and the device types selected. The users can refer to section 16.4.3, and set the other cells.

+ - Export

#	Device Name	Register	Starting Address	Range	<->	#	Device Name	Register	Starting Address	Range	Size
1	AH-01	D	500	D500 ~ D509	<-	2	AH-02	M	1000	M1000 ~ M1159	10
2	AH-02	D	1000	D1000 ~ D1019	<-	1	AH-01	L	0	L0 ~ L19	20

#	Device Name	Register	Starting Address	Range	<->	#	Device Name	Register	Starting Address	Range	Size
1	AH-01	D	500	D500 ~ D509	<-	2	AH-02	M	1000	M1000 ~ M1159	10
2	AH-02	D	1000	D1000 ~ D1019	<-	1	AH-01	L	0	L0 ~ L19	20
1	AH-01	M	0	M0 ~ M15	<-	2	AH-02	L	0	L0 ~ L0	1

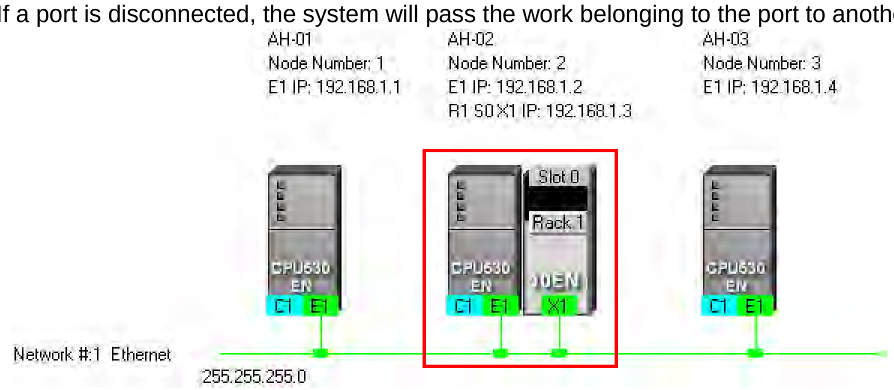
11.2.2.5 Start Mode of an Ether Link

There are three start modes. Please refer to the table below for more information.

Start mode	Description
Always Stop	During the operation of the PLC, no data exchange is performed.
Always Run	When the PLC runs, data exchange is performed.
SM Flag	The performance of data exchange depends on a special auxiliary relay in the PLC. After users select **SM Flag**, they can set the initial state of the related special auxiliary relay.

***. Please refer to manuals or technical documents for more information about special auxiliary relays related to Ether Links.**

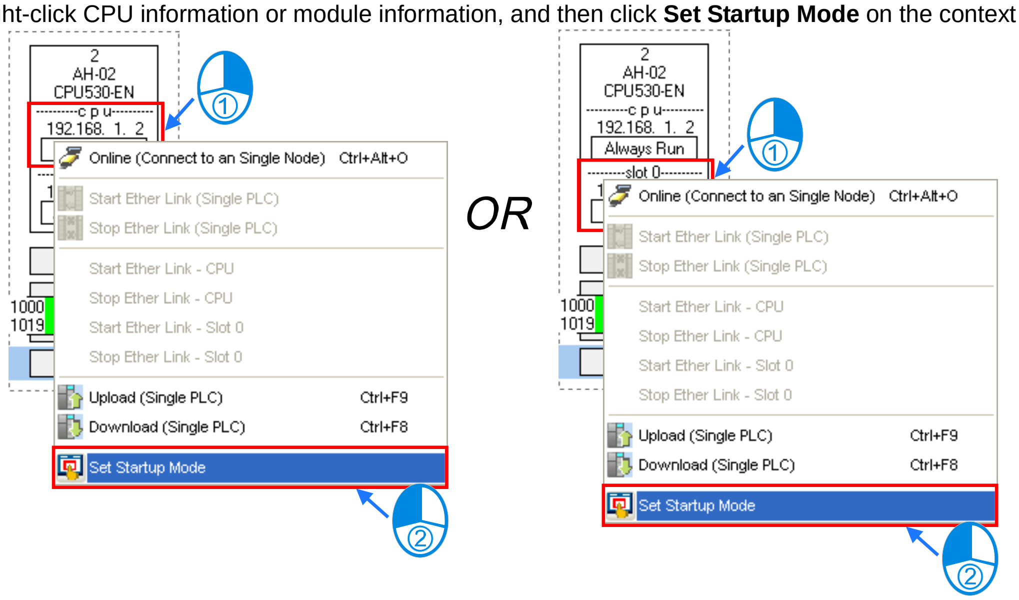
The execution of an Ether Link is based on the nodes in a network. If some of the ports that a node has are connected to a network, users can set the start modes of the ports separately. When the Ether Link constructed is executed, the system automatically distributes reading/writing work to the ports according to the start modes of the ports. If a port is disconnected, the system will pass the work belonging to the port to another port.



There are three ways to set the start mode of a node.

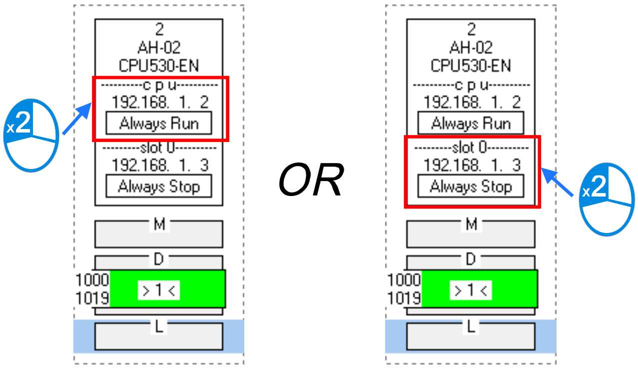
- **Method 1**

  Right-click CPU information or module information, and then click **Set Startup Mode** on the context menu.



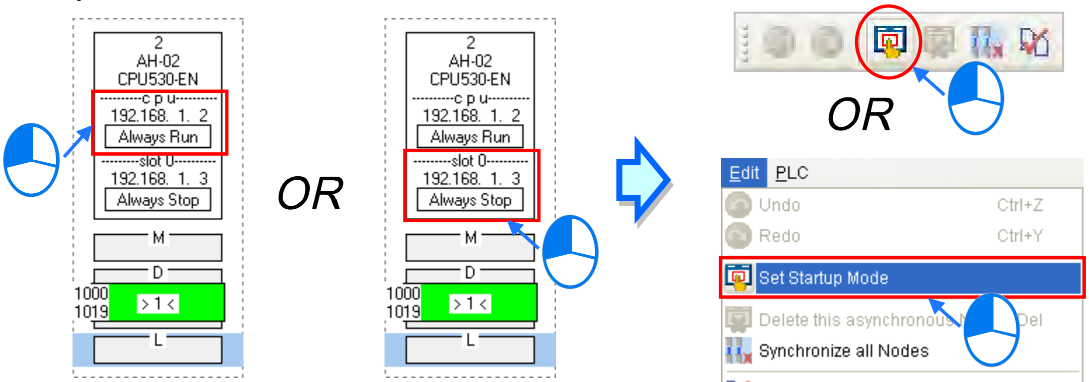
- **Method 2**

  Double-click CPU information or module information.

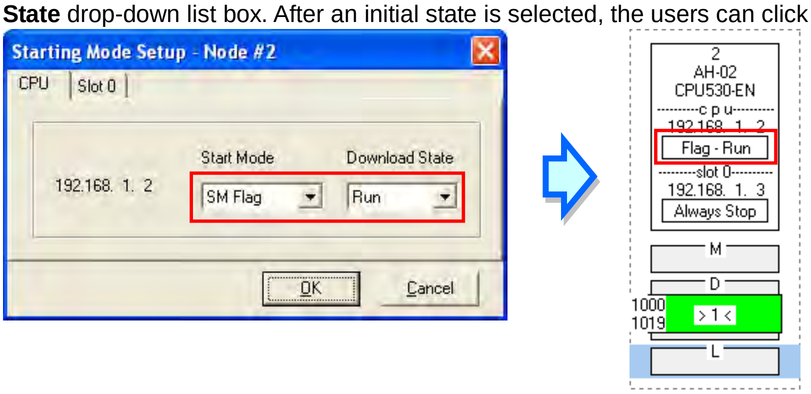


- **Method 3**

  After the users click CPU information or module information, they have to click on the toolbar, or **Set Startup Mode** on the **Edit** menu.



After the users use one of the methods described above, the Starting Mode Setup window will appear. The page displayed in the window varies with the information selected. The users can click the tabs in the window. Select a mode in the **Start Mode** drop-down list box. If **SM Flag** is selected, the users can select an initial state in the **Download State** drop-down list box. After an initial state is selected, the users can click **OK**.



11.2.2.6 Downloading the Parameters Related to an Ether Link

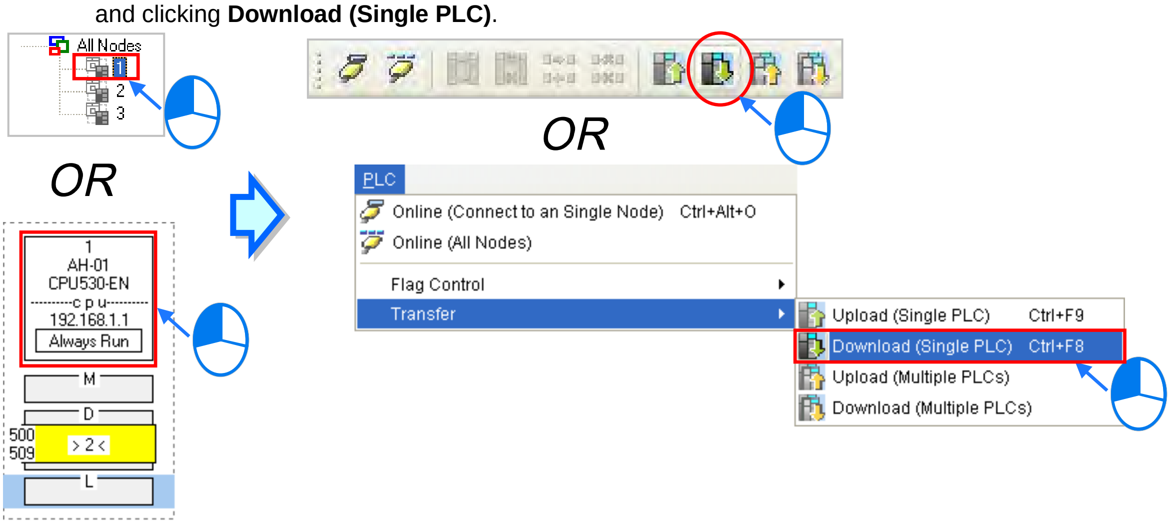
After the parameters related to an Ether Link are set, users have to download the parameters to PLCs. The PLCs can perform data exchange after the parameters are downloaded.

- **Single node**

  Only the data demanding setting related to the PLC selected, the start mode of the PLC selected, and the start modes of the modules connected to the PLC are downloaded. Before the users download the related parameters, they have to make sure that the system connects to the PLC normally, and they have completed the communication setting in NWCONFIG. Please refer to section 20.1.3 from ISPSoft User Manual for more information.

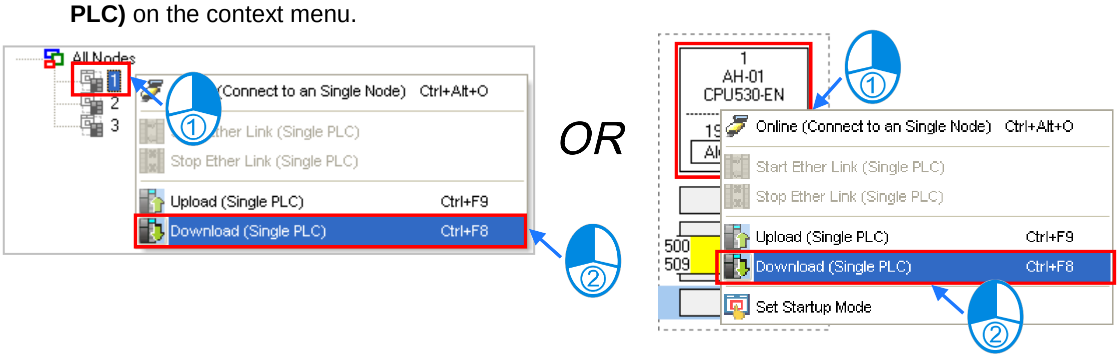
  - **Method 1**

    Select a data demanding node, and then click  on the toolbar. The users can also download the related parameters by selecting a data demanding node, clicking the **PLC** menu, pointing to **Transfer**, and clicking **Download (Single PLC)**.



  - **Method 2**

    Select a data demanding node, right-click the data demanding node, and click **Download (Single PLC)** on the context menu.

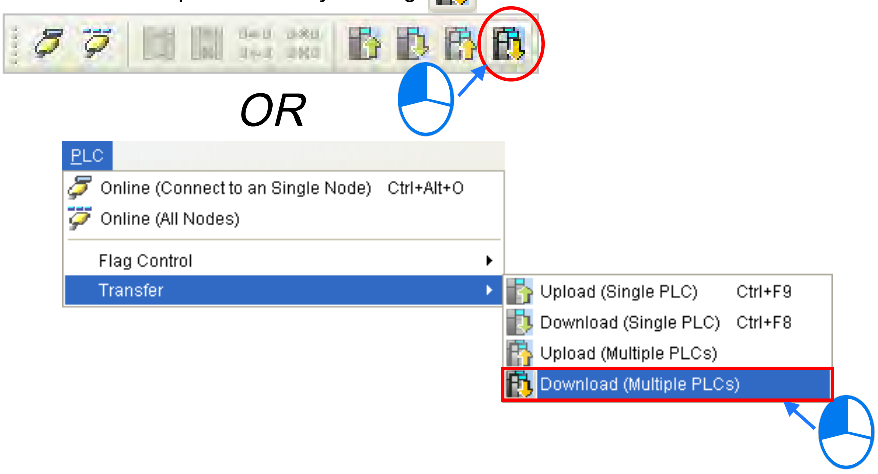


- **Multiple nodes**

The data demanding setting related to all the nodes, and the start modes of all the nodes are downloaded. Before the users download the related parameters, they have to make sure that all the PLCs and all the modules are connected to an Ethernet network, and can connect to NWCONFIG through Ethernet. The connection type that the driver selected in the **Driver Name** drop-down list box in the **Select a Driver** window uses must be Ethernet, otherwise the related parameters can not be downloaded. Please refer to section 20.1.3 from ISPSoft User Manual for more information.

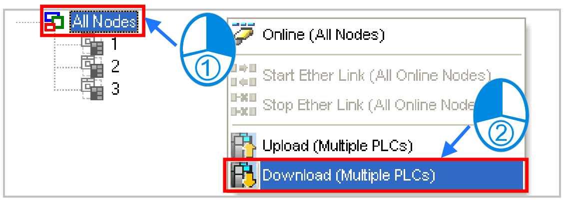
➢ **Method 1**

Click the **PLC** menu, point to **Transfer**, and click **Download (Multiple PLCs)**. The users can also download the related parameters by clicking  on the toolbar.



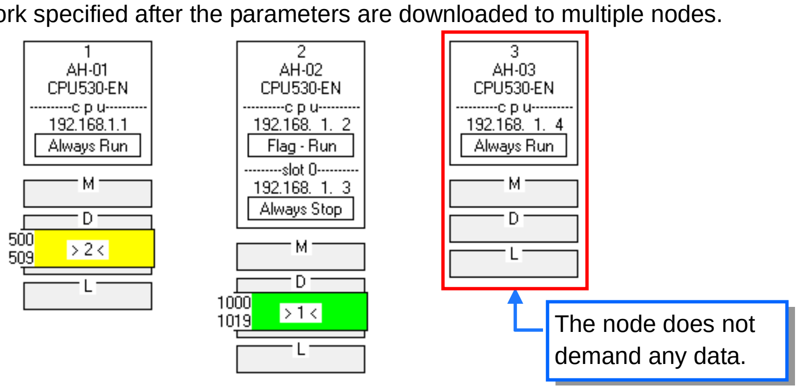
➢ **Method 2**

Select **All Nodes** on the node list, right-click **All Nodes**, and click **Download (Multiple PLCs)** on the context menu.



<u>Additional remark</u>

If the parameters set include a node which does not demand any data, the node will not demand any data through the network specified after the parameters are downloaded to multiple nodes.



11.2.2.7 Uploading the Parameters Related to an Ether Link

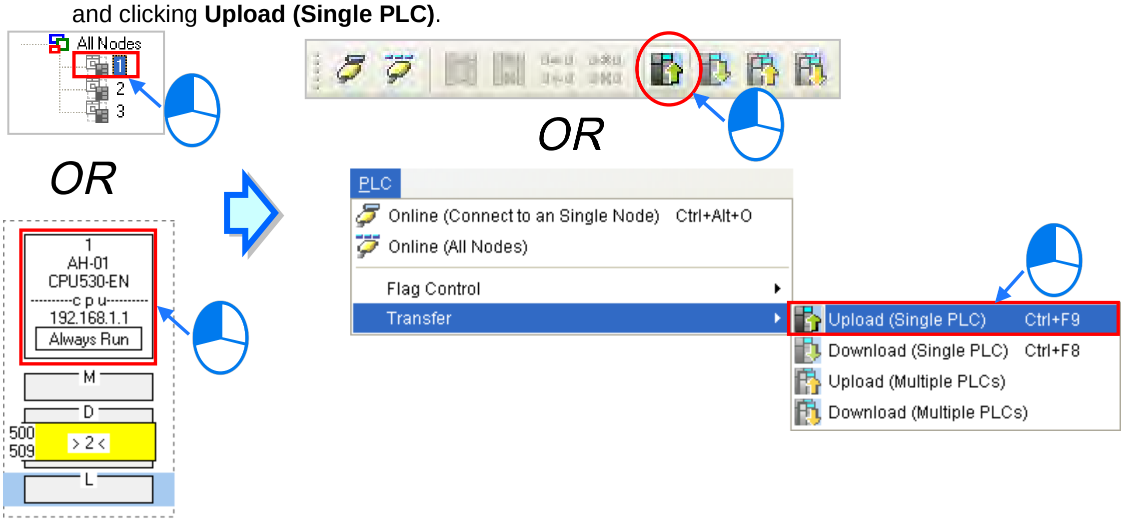
Users can upload the parameters related to an Ether Link in a PLC.

- **Single node**

  Only the parameters related to an Ether Link in the node selected are uploaded. Before the users upload the related parameters in a PLC, they have to make sure that the system connects to the PLC normally, and they have completed the communication setting in NWCONFIG. Please refer to section 20.1.3 from ISPSoft User Manual for more information.

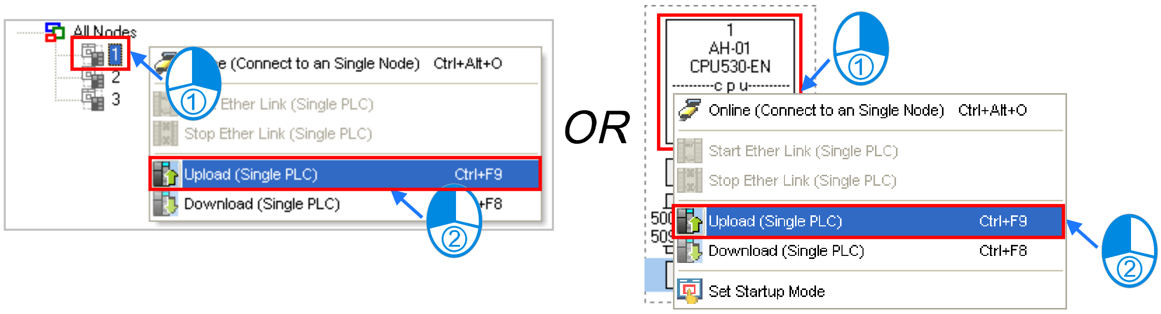
  - **Method 1**

    Select a data demanding node, and then click  on the toolbar. The users can also download the related parameters by selecting a data demanding node, clicking the **PLC** menu, pointing to **Transfer**, and clicking **Upload (Single PLC)**.



  - **Method 2**

    Select a data demanding node, right-click the data demanding node, and click **Upload (Single PLC)** on the context menu.

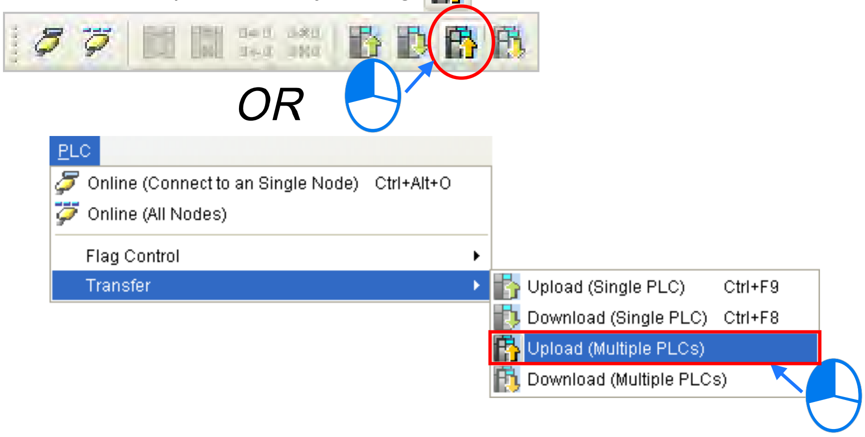


- **Multiple nodes**

  The parameters related to an Ether Link in all the nodes are uploaded. Before the users upload the related parameters, they have to make sure that all the PLCs and all the modules are connected to an Ethernet network, and can connect to NWCONFIG through Ethernet. The connection type that the driver selected in the **Driver Name** drop-down list box in the **Select a Driver** window uses must be Ethernet, otherwise the related parameters can not be uploaded. Please refer to 20.1.3 from ISPSoft User Manual for more information.

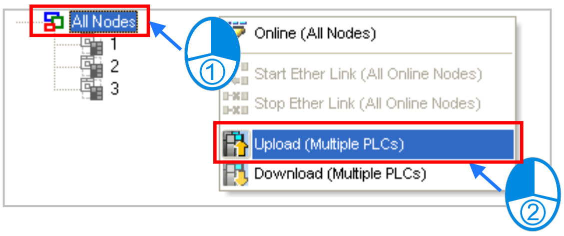
  - **Method 1**

    Click the **PLC** menu, point to **Transfer**, and click **Upload (Multiple PLCs)**. The users can also download the related parameters by clicking  on the toolbar.



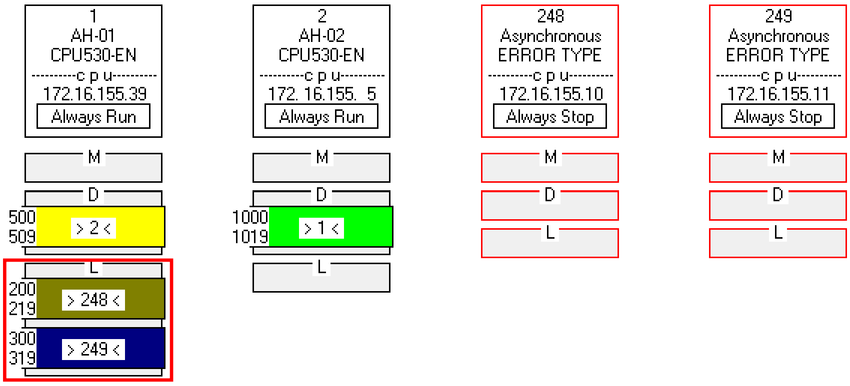
  - **Method 2**

    Select **All Nodes** on the node list, right-click **All Nodes**, and click **Upload (Multiple PLCs)** on the context menu.



<u>**Additional remark**</u>

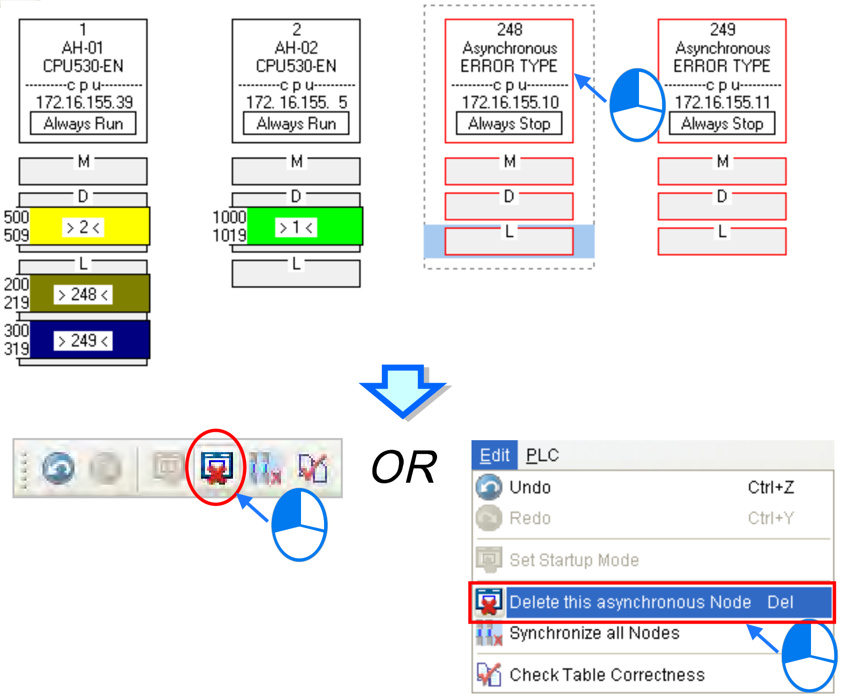
After the parameters which include a node not configured in NWCONFIG are uploaded, the node which is not configured in NWCONFIG will be called an asynchronous device, and will be in red. If the setting of an Ether Link includes an asynchronous device, the system does not allow the Ether Link to be monitored, and it does not allow the parameters related to the Ether Link to be downloaded.



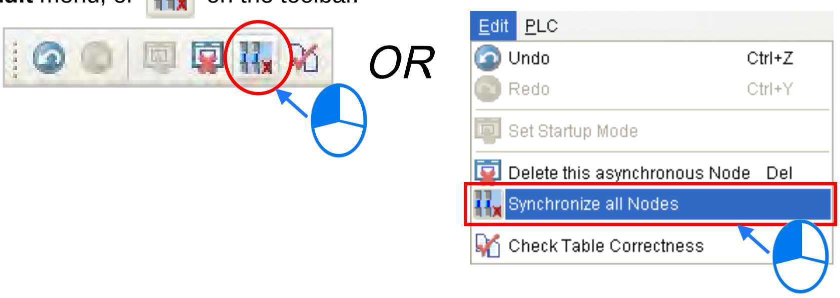
11.2.2.8 Deleting Asynchronous Device

If the setting of an Ether Link includes asynchronous devices, the system does not allow the Ether Link to be monitored, and it does not allow the parameters related to the Ether Link to be downloaded. Users have to find out the reason for the existence of the asynchronous devices. If the network configuration in NWCONFIG is incorrect, the users have to modify the network configuration, and upload the parameters related to the Ether Link again. If the parameters uploaded are not applicable to the current network configuration, the users can delete the asynchronous devices.

Select an asynchronous device which will be deleted, and then click **Delete This Asynchronous Node** on the **Edit** menu, or  on the toolbar.



If the users want to delete all the asynchronous devices at the same time, they can click **Synchronize All Nodes** on the **Edit** menu, or  on the toolbar.



11.2.2.9 Enabling / Disabling the Online Monitoring Function

In the **Ether Link Configuration** window, users can execute or test the Ether Link constructed by means of the online monitoring functions provided by NWCONFIG. The users can enable/disable the function of monitoring a single node/multiple nodes online.

Enabling/Disabling	Description	
Single node	Function	Enabling or disabling the function of monitoring the node selected online
	Condition	The users have to make sure that ISPSoft can connect to the PLC selected normally, and they have completed the communication setting in NWCONFIG.
Multiple nodes	Function	Enabling or disabling the function of monitoring all the nodes online
	Condition	The users have to make sure that all the nodes are connected to a network, and can connect to ISPSoft through Ethernet. The connection type that the driver selected in the **Driver Name** drop-down list box in the **Select a Driver** window uses must be Ethernet.

***. Please refer to section 20.1.3 from ISPSoft User Manual for more information about the communication setting in NWCONFIG.**

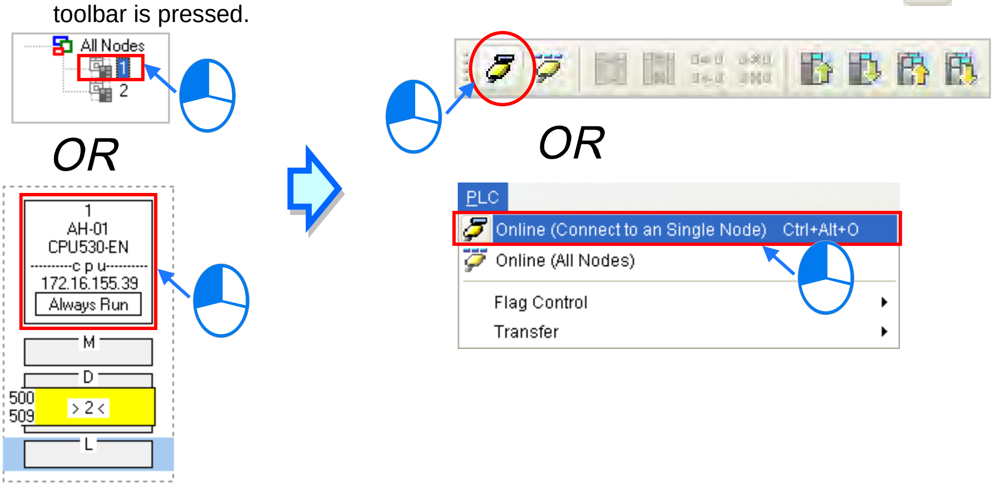
Before the users enable the online monitoring function, they have to make sure that all the nodes are connected according to the network framework created in NWCONFIG, and can operate normally.

(a) Every node has been connected to a network according to the network framework created in NWCONIFG.
(b) The users have set the parameters for Ethernet ports of the nodes by means of HWCOFNIG, and the parameters have been downloaded to the PLCs and the modules. The setting of the parameters must be consistent with the setting in NWCONFIG.
(c) The parameters related to an Ether Link have been downloaded to the PLC selected.
(d) Every node is powered up, and can operate normally.

A. Enabling a Monitoring Function

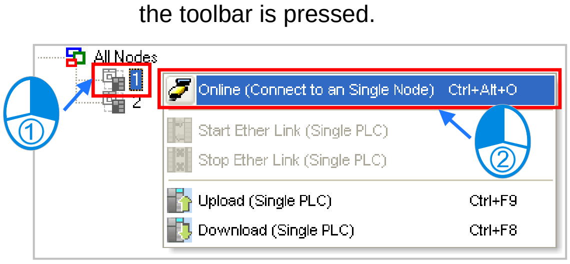
- **Enabling the function of monitoring a single node**
  - **Method 1**

    Select a data demanding node, and then click on the toolbar, or **Online (Connect to a Single node)** on the **PLC** menu. When the data demanding node is monitored, on the toolbar is pressed.

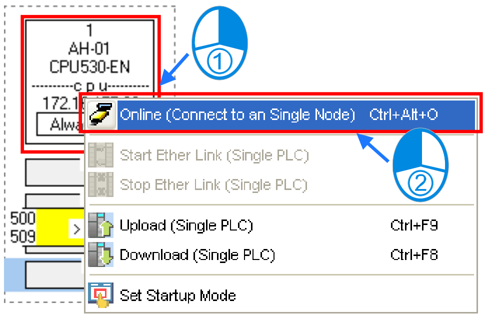


➢ **Method 2**

Select a data demanding node, right-click the data demanding node, and click **Online (Connect to a Single Node)** on the context menu. When the data demanding node is monitored, on the toolbar is pressed.



OR

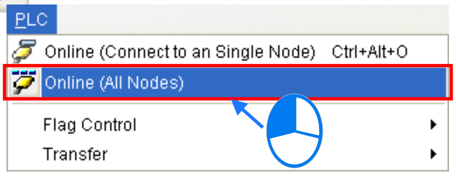


- **Enabling the function of monitoring multiple nodes**

➢ **Method 1**

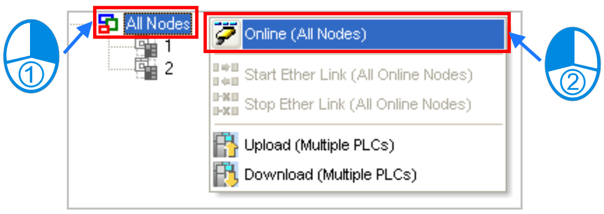
Click **Online (All Nodes)** on the **PLC** menu, or on the toolbar.

OR



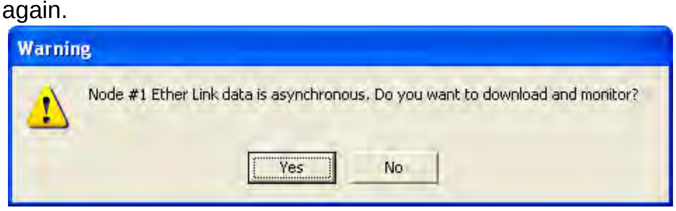
➢ **Method 2**

Select **All Nodes** on the node list, right-click **All Nodes**, and click **Online (All Nodes)** on the context menu.



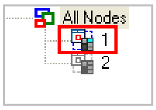
<u>**Additional remark**</u>

Before the system enters a monitoring mode, it checks whether the Ether Link constructed in the **Ether Link Configuration** window is consistent with the setting in the PLCs. If the Ether Link constructed in the **Ether Link Configuration** window is not consistent with the setting in the PLCs, the system will ask the users to download the related parameters again.

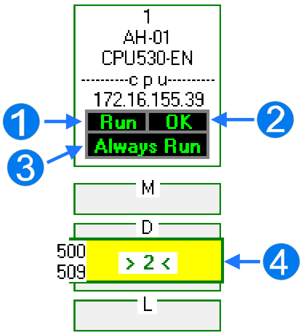


B. Monitoring Statuses

After the system enters a monitoring mode, the node which is monitored will be colored on the node list.



Besides, the words and the pictures in the display area will indicate the execution status of the current Ether Link after the system enters a monitoring mode.

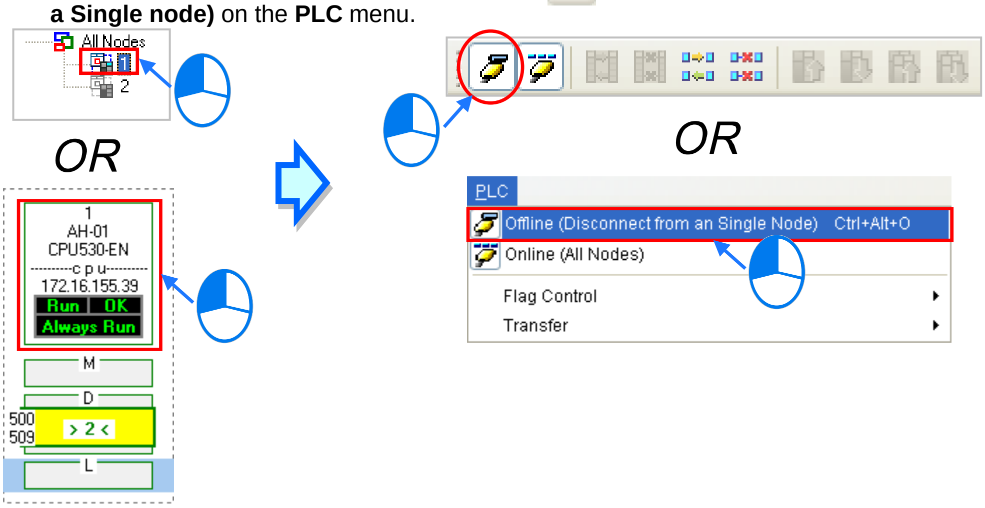


Status	Description
❶ Running/Stopping	Run: The Ether Link constructed is executed.
	Stop: The Ether Link is not executed.
❷ Operating status	OK: The Ether Link constructed is executed normally.
	Error: The Ether Link constructed is not executed normally.
❸ Start mode	Always Stop: **Always Stop**
	Always Run: **Always Run**
	Flag Mode: **SM Flag**
❹ Data block	500 509 > 2 <: The data exchange is being performed.
	500 509 ≠ 2 ≠: The performance of the data exchange stops.

C. Disabling a Monitoring Function

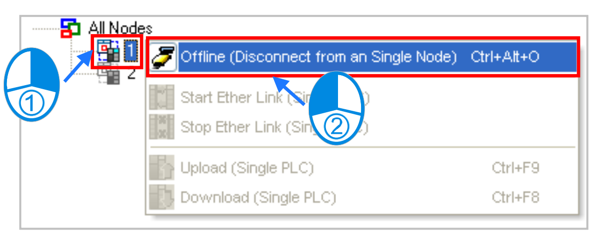
- **Disabling the function of monitoring a single node**
  - **Method 1**

    Select a data demanding node, and then click on the toolbar, or **Offline (Disconnect from a Single node)** on the **PLC** menu.

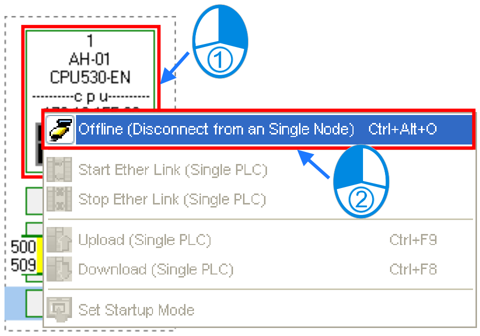


➢ **Method 2**

Select a data demanding node, right-click the data demanding node, and click **Offline (Disconnect from a Single Node)** on the context menu.



OR

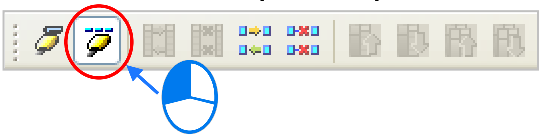


When the data demanding node selected is not monitored, on the toolbar is not pressed. If another node is monitored, will be pressed.

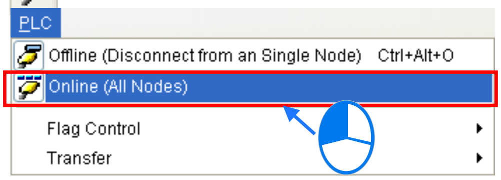
- **Disabling the function of monitoring multiple nodes**

➢ **Method 1**

Click **Online (All Nodes)** on the **PLC** menu, or on the toolbar.

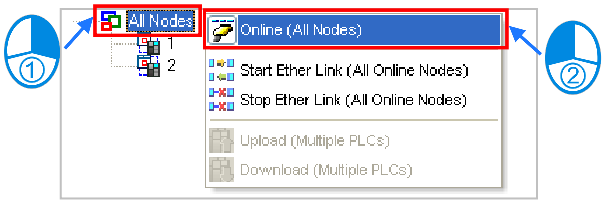


OR



➢ **Method 2**

Select **All Nodes** on the node list, right-click **All Nodes**, and click **Online (All Nodes)** on the context menu.



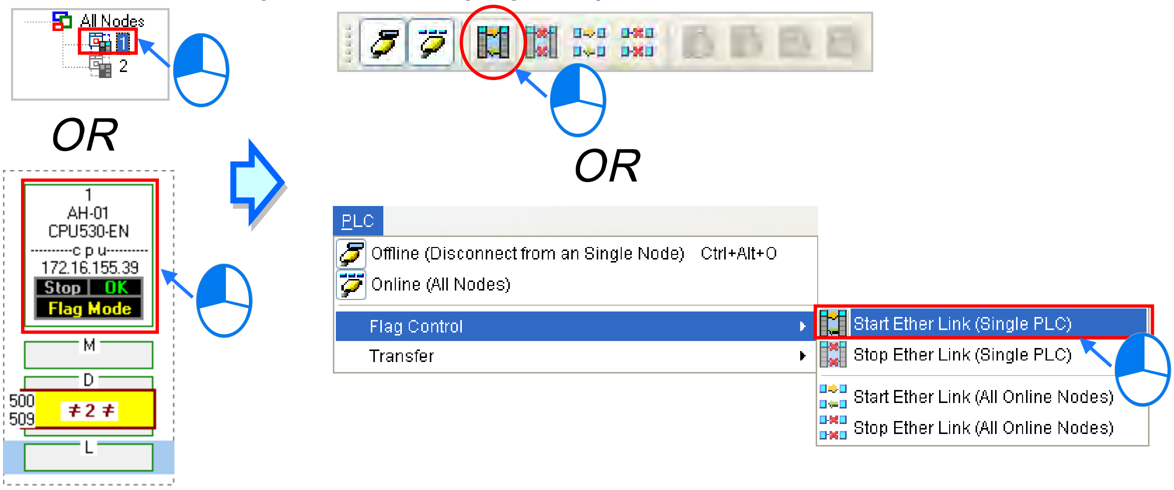
11.2.2.10 Starting / Stopping the Execution of an Ether Link Online

If the start mode of a node is **SM Flag**, users can make the node start or stop the execution of the Ether Link constructed by means of controlling the state of the related flag when the node is monitored online. If the node is not monitored online, the users can not make the node start or stop the execution of the Ether Link constructed by means of controlling the state of the related flag.
Users can make a single node/multiple nodes start or stop the execution of the Ether Link constructed. The conditions for making a single node/multiple nodes start or stop the execution of the Ether Link constructed are the same as the conditions for enabling/disabling the function of monitoring a single node/multiple nodes online. Please refer to section 11.2.2.9 for more information.

A. Starting the Execution of an Ether Link

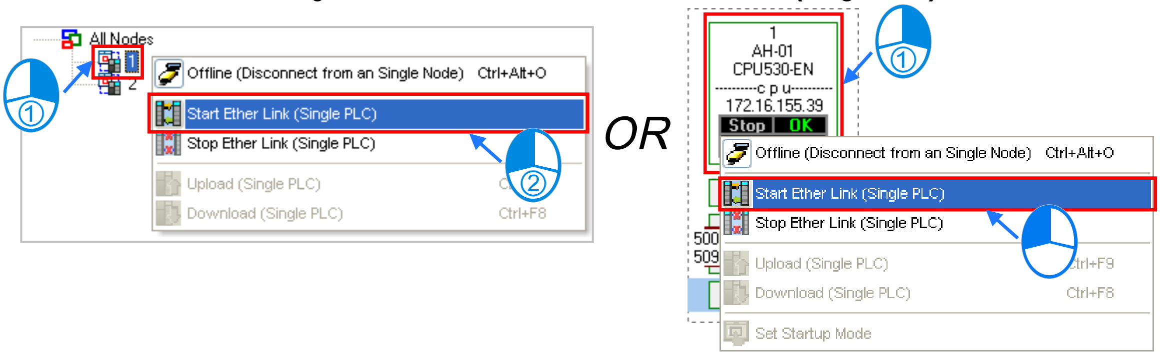
- **Making a single node start the execution of an Ether Link**
  - **Method 1**

    If users want to make a node start the execution of the Ether Link constructed, they have to select the node, and click on the toolbar. They can also make the node start the execution of the Ether Link constructed by selecting the node, clicking the **PLC** menu, pointing to **Flag Control**, and clicking **Start Ether Link (Single PLC)**.



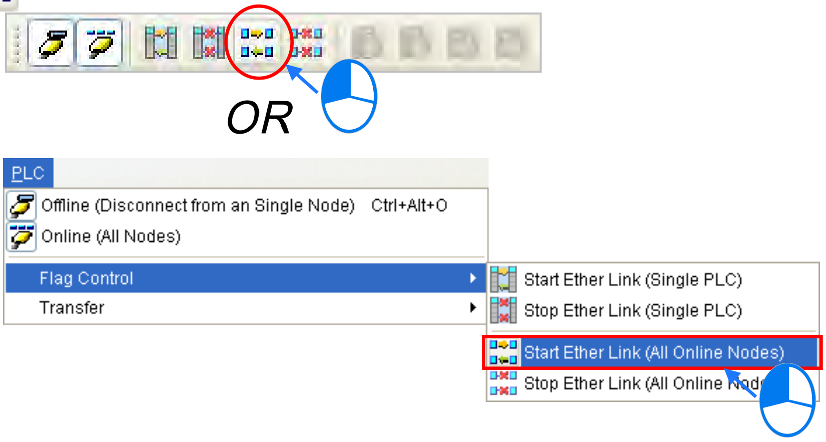
  - **Method 2**

    Select a node, right-click the node, and click **Start Ether Link (Single PLC)** on the context menu.



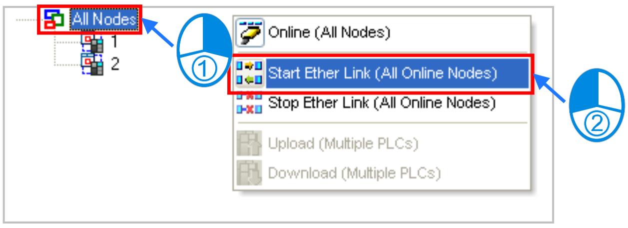
- **Making multiple nodes start the execution of an Ether Link**
  - **Method 1**

    If users want to make all the nodes start the execution of the Ether Link constructed, they have to click the **PLC** menu, point to **Flag Control**, and click **Start Ether Link (All Online Nodes)**. The users can also make all the nodes start the execution of the Ether Link constructed by clicking on the toolbar.



  - **Method 2**

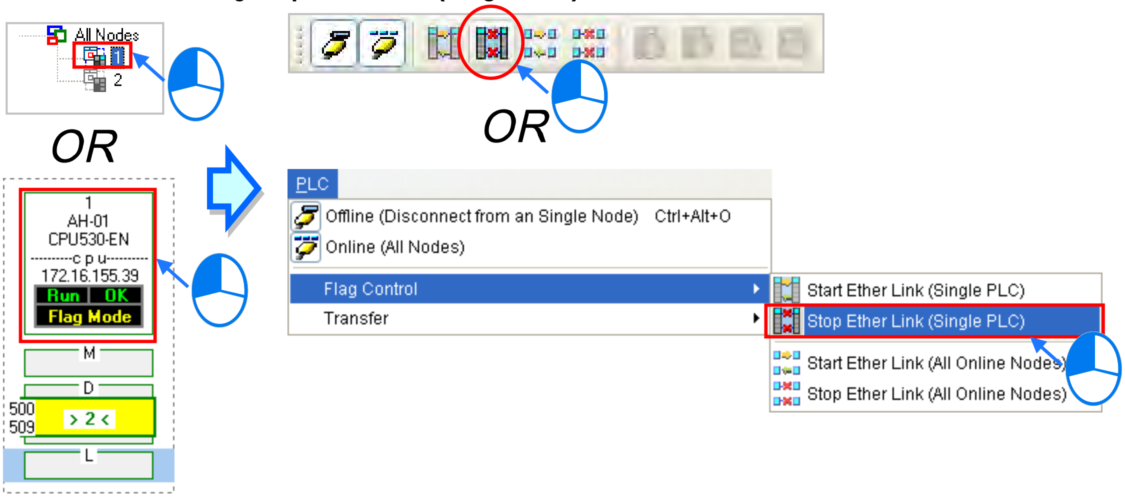
    Select **All Nodes** on the node list, right-click **All Nodes**, and click **Start Ether Link (All Online Nodes)** on the context menu.



B. Stopping the Execution of an Ether Link

- **Making a single node stop the execution of an Ether Link**
  - **Method 1**

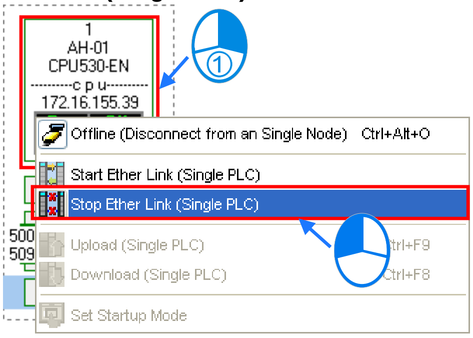
    If users want to make a node stop the execution of the Ether Link constructed, they have to select the node, and click on the toolbar. They can also make the node stop the execution of the Ether Link constructed by selecting the node, clicking the **PLC** menu, pointing to **Flag Control**, and clicking **Stop Ether Link (Single PLC)**.



➢ **Method 2**

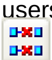
Select a node, right-click the node, and click **Stop Ether Link (Single PLC)** on the context menu.

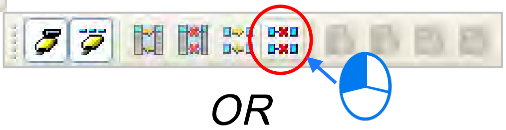
OR



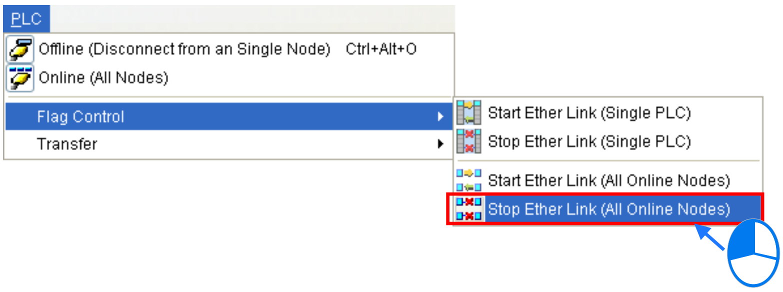
- **Making multiple nodes stop the execution of an Ether Link**

➢ **Method 1**

If users want to make all the nodes stop the execution of the Ether Link constructed, they have to click the **PLC** menu, point to **Flag Control**, and click **Stop Ether Link (All Online Nodes)**. The users can also make all the nodes stop the execution of the Ether Link constructed by clicking  on the toolbar.

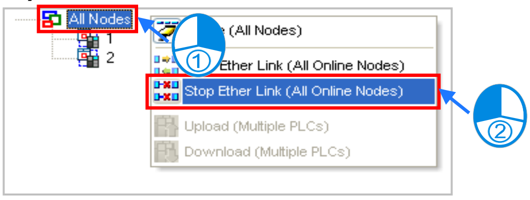


OR



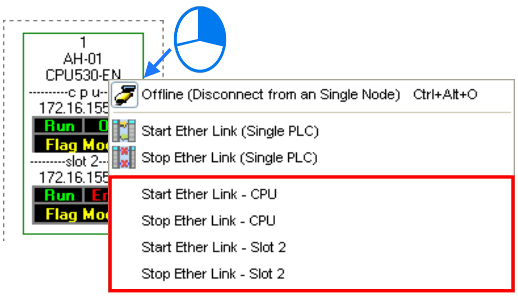
➢ **Method 2**

Select **All Nodes** on the node list, right-click **All Nodes**, and click **Stop Ether Link (All Online Nodes)** on the context menu.



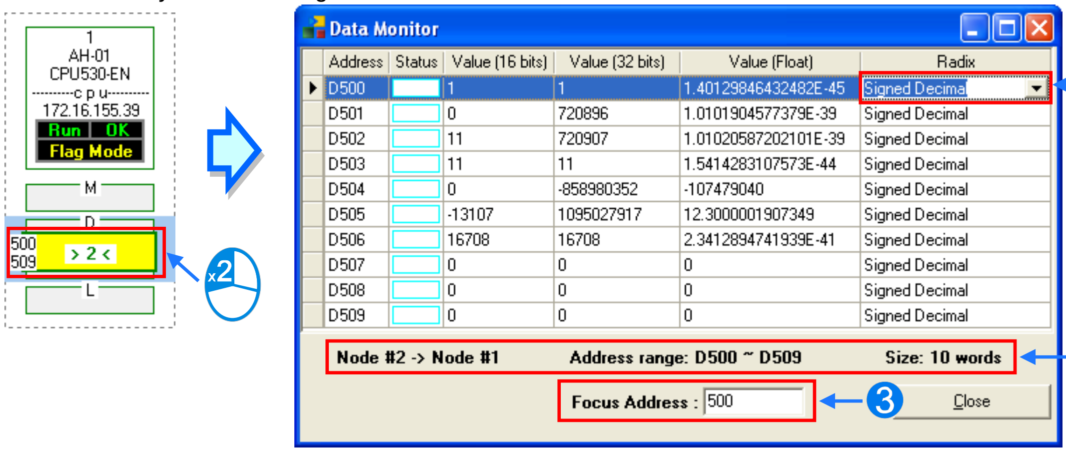
Additional remark

If a node in the display area has several Ethernet ports, users can make a port start/stop the execution of the Ether Link constructed by means of clicking an item on the context menu which appears after they right-click the node. The execution of an Ether Link is based on the nodes in a network. If users make a port that a node has stop the execution of the Ether Link constructed, another node that the node has can still execute the Ether Link constructed.



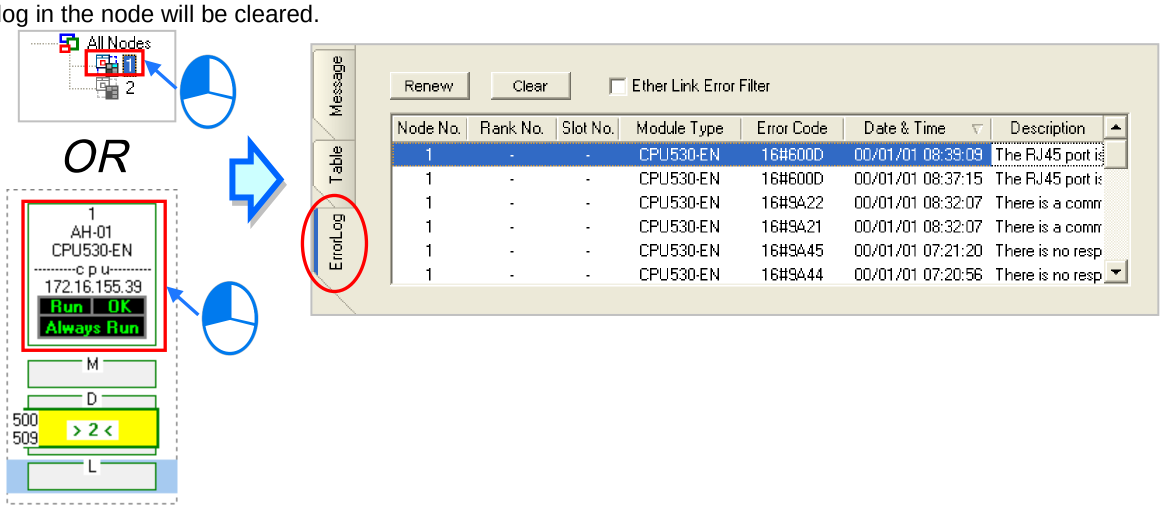
11.2.2.11 Monitoring Table and Error Log

After users double-click a data block, the **Data Monitor** window will appear. The users can view the values in the window. They can not change the values in the window.



❶ After users click the **Radix** cell for a device, they can select a method of representing the value in the device on the drop-down list.
❷ The information about the data block which is monitored is displayed.
❸ Users can type a device address in this box. After the users press **Enter** on the keyboard, they can easily view the device address in the window.

After a node is selected, the error log in the node will be displayed in the **Error Log** page. If the users select the **Ether Link Error Filter** checkbox, only the error log related to the Ether Link constructed will be listed. Besides, after the users click **Renew**, the error log in the node will be retrieved, and the error log retrieved will be displayed in the **Error Log** page. After the users click **Clear**, the error log in the **Error Log** page and the error log in the node will be cleared.



If the node selected consists of a CPU module and a module, the error log in the **Error Log** page will be composed of the errors occurring in the CPU module and the errors occurring in the module. If an error code in the **Error Log** page corresponds to an error occurring in the module, the model name of the module will be displayed in the **Module Type** cell for the error code, the rack on which the module is installed will be indicated by the number in the **Rack No.** cell for the error code, and the slot in which the module is installed will be indicated by the number in the **Slot No.** cell for the error code. If an error code in the **Error Log** page corresponds to an error occurring in the CPU module, there will be no numbers in the **Rack No.** cell for the error code and the **Slot No.** cell for the error code.

11.2.3 Related Special Auxiliary Relays and Special Data Registers

1. Descriptions of the related special auxiliary relays:

Device	Name	R/W	Description
SM1770	Executing an Ether Link (CPU)	R/W	OFF: The execution of an Ether Link stops. ON: An Ether Link is executed.
SM1772 ↓ SM1787	Executing an Ether Link (Port 0) ↓ Executing an Ether Link (Port 15)	R/W	OFF: The execution of an Ether Link stops. ON: An Ether Link is executed.
SM1788	Ether Link error (CPU)	R	OFF: An Ether Link is executed incorrectly. ON: An Ether Link is executed correctly.
SM1790 ↓ SM1805	Ether Link error (Port 0) ↓ Ether Link error (Port 15)	R	OFF: An Ether Link is executed incorrectly. ON: An Ether Link is executed correctly.
SM1806	Status of an Ether Link (CPU)	R	OFF: The execution of an Ether Link stops. ON: An Ether Link is executed.
SM1808 ↓ SM1823	Status of an Ether Link (Port 0) ↓ Status of an Ether Link (Port 15)	R	OFF: The execution of an Ether Link stops. ON: An Ether Link is executed.
SM1824 ↓ SM1951	Status of storage block 1~128	R/W	OFF: A storage block is inactive in performing data exchange. ON: A storage block is active in performing data exchange.

2. Descriptions of the related special data registers:

Device	Name	R/W	Description
SR1792	High word of the IP address to which storage block 1 is connected	R	High word of the IP address to which storage block 1 is connected Example: If the remote IP address is 192.168.1.100, the value in SR1792 will be 0xC0A8.
SR1793	Low word of the IP address to which storage block 1 is connected	R	Low word of the IP address to which storage block 1 is connected Example: If the remote IP address is 192.168.1.100, the value in SR1793 is 0x0164.
⋮			
SR2046	High word of the IP address to which storage block 128 is connected	R	High word of the IP address to which storage block 128 is connected Example: If the remote IP address is 192.168.1.100, the value in SR2046 will be 0xC0A8.
SR2047	Low word of the IP address to which storage block 128 is connected	R	Low word of the IP address to which storage block 128 is connected Example: If the remote IP address is 192.168.1.100, the value in SR2047 will be 0x0164.

11.3 Data Exchange Function

AH500 series can exchange data with another Ethernet PLC not only by means of instructions, but also by a table interface.
AH500 Basic CPU modules (AHCPU5x0-EN Series) can exchange data via Modbus TCP and AH500 Advanced CPU modules (AHCPU5x1 Series and AHCPU560-EN) can exchange data via Modbus TCP and Modbus.

11.3.1 Modbus Data Exchange

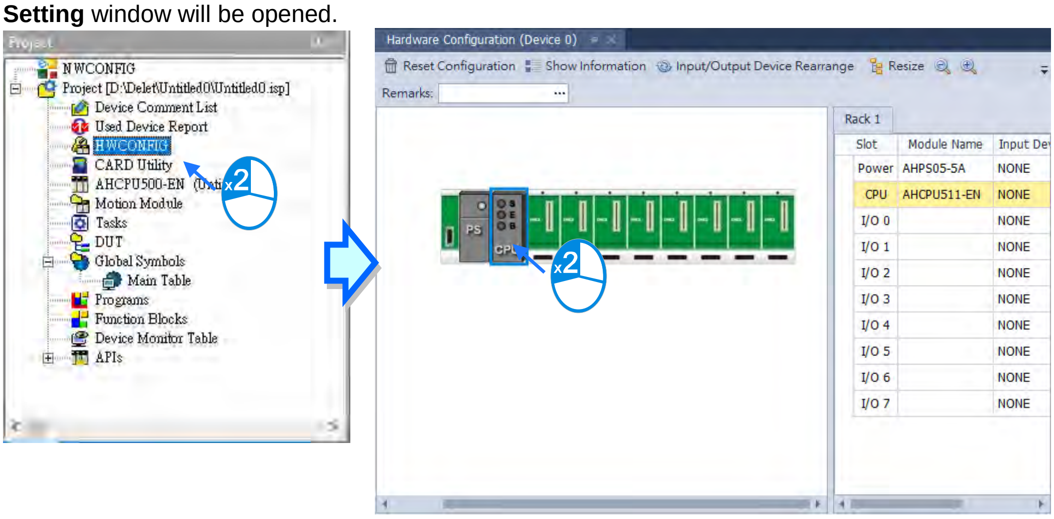
11.3.1.1 Modbus Data Exchange

Data exchange between electronic devices can be achieved via Modbus protocol. Through Modbus protocol, users can exchange data among Delta devices and any 3rd party devices, as long as they comply with the Modbus standard. A chart showing information concerning Modbus data exchange is provided below.

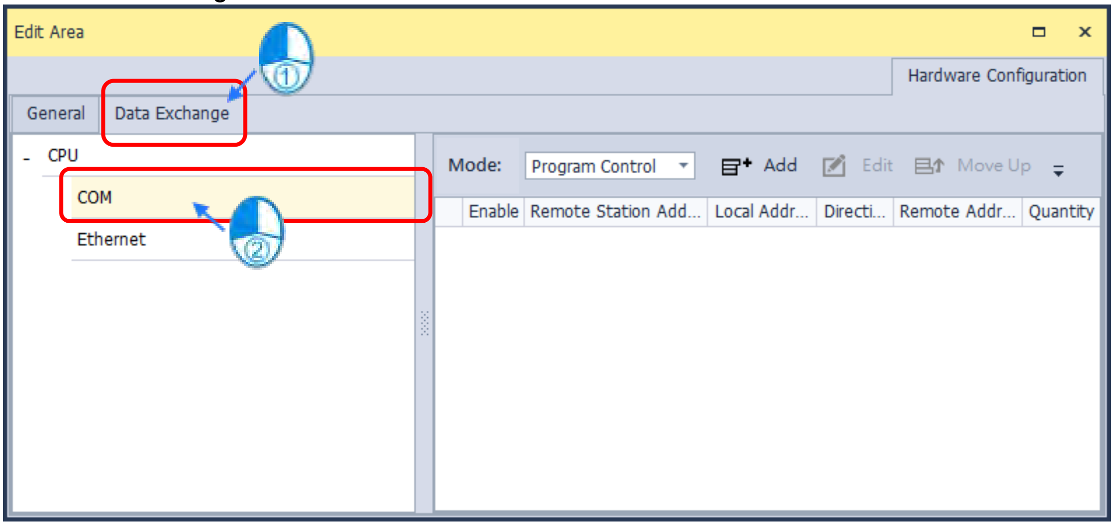
Communication mode	Modbus		
Maximum number of connections	32		
Communication protocol	Standard Modbus and AH500 communication protocol		
Maximum quantity of data which can be read/written	Remote terminal unit	AH500 series CPU module	400 words 6400 bits
		DVP series PLCs	100 words 100 bits
		Others	100 words 100 bits
Supported devices	Remote terminal unit	AH500 series CPU module	X, Y, M, SM, SR, D, T, C, S, E
		DVP series PLCs	X, Y, M, D
		Others	Logical address 0x0000~0xFFFF
Supported models	AH500 advanced CPU modules (AHCPU501/511/521/531)		

11.3.1.2 Modbus Data Exchange - PLC Parameter Setting

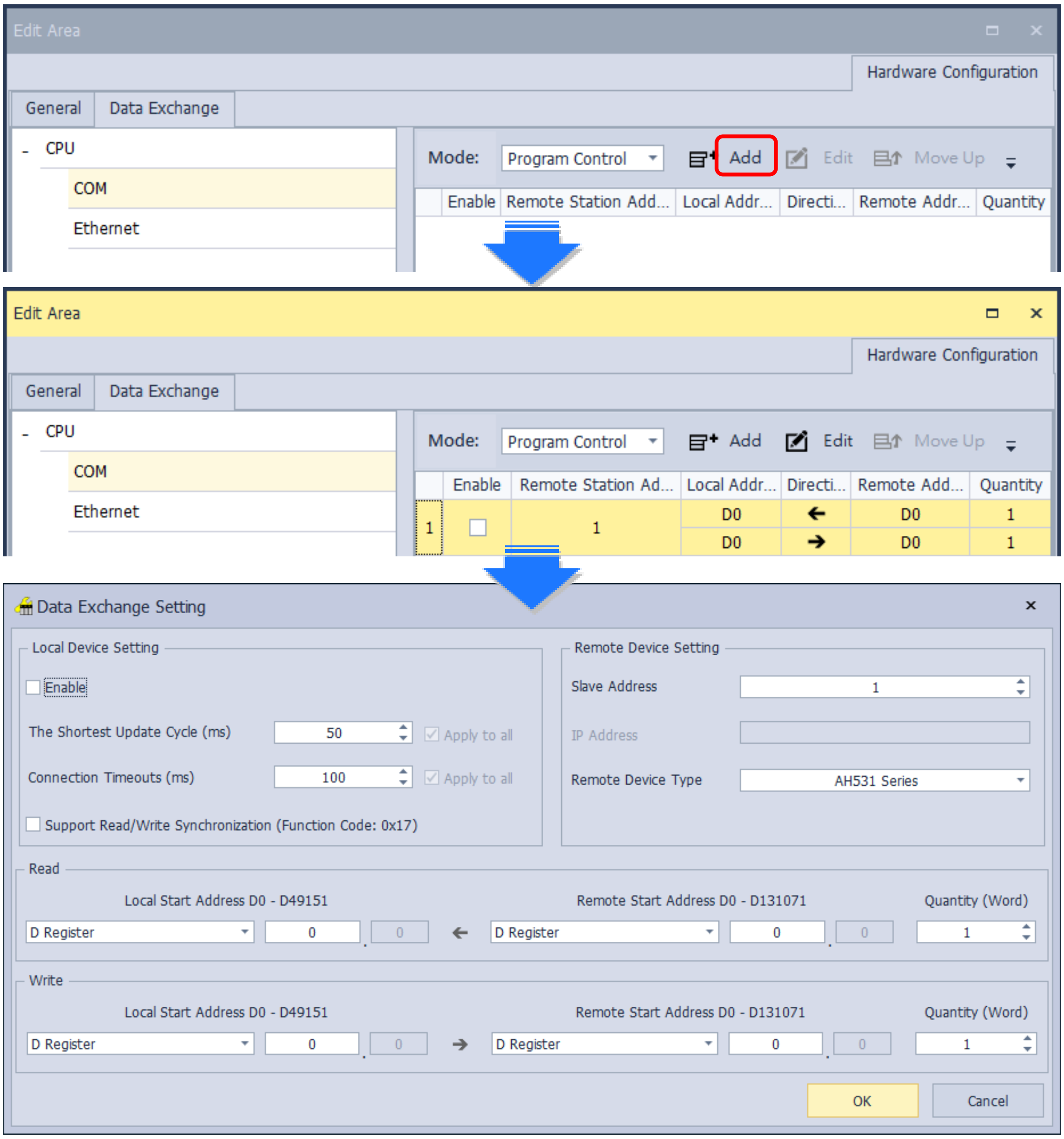
Double-click **HWCONFIG**, and then double-click **CPU**. After **CPU** is double-clicked, the **PLC Parameter Setting** window will be opened.



Click the **Data Exchange - COM**.



Since no data is set, there is a blank table in the **Data Exchange** section. After **Add** is clicked, an item will be inserted. After the item is double-clicked, the **Item 1** window will appear.



The **Item 1** window is described below.

- **Enable**

  If users want to make the PLC execute the data exchange, they have to select the **Enable** checkbox. If the users want to stop the data exchange temporarily, they can leave the **Enable** checkbox unselected.

- **Slave Address**

  Users have to set the station address of the slave with which the PLC will exchange data. If the users can not set the station address of the slave to which the PLC will connect, they can type 0 in the **Slave Address** box.

- **IP Address**

  Users have to type the IP address of the slave to which the PLC will connect in the **IP Address** box.

- **The Shortest Update Cycle (ms)**

  Users have to set the shortest cycle of updating the data exchange. A millisecond is a unit of time. When the data exchange is executed, it is updated at specific intervals. However, if the data exchange is prolonged due to network congestion or other reasons, it will be updated according to the actual situation.

- **Connection Timeout (ms)**

  Users can set the longest time that is allowed to elapse before the data exchange is executed. A millisecond is a unit of time. If the data exchange is not executed after the longest time set elapses, a connection timeout will occur. The PLC still tries to connect to the slave station selected at specific intervals. Once the PLC connects to the slave station selected, the data exchange will be executed.

- **Support read/write synchronization (Function code 0x17)**

  If the slave to which the PLC will connect can complete reading and writing simultaneously (Modbus function code 0x17), users can select the **Support read/write synchronization (Function code 0x17)** checkbox. After the **Support read/write synchronization (Function code 0x17)** checkbox is selected, the PLC will read data and write data simultaneously, and the efficiency in exchanging data will increase.

- **Device Type**

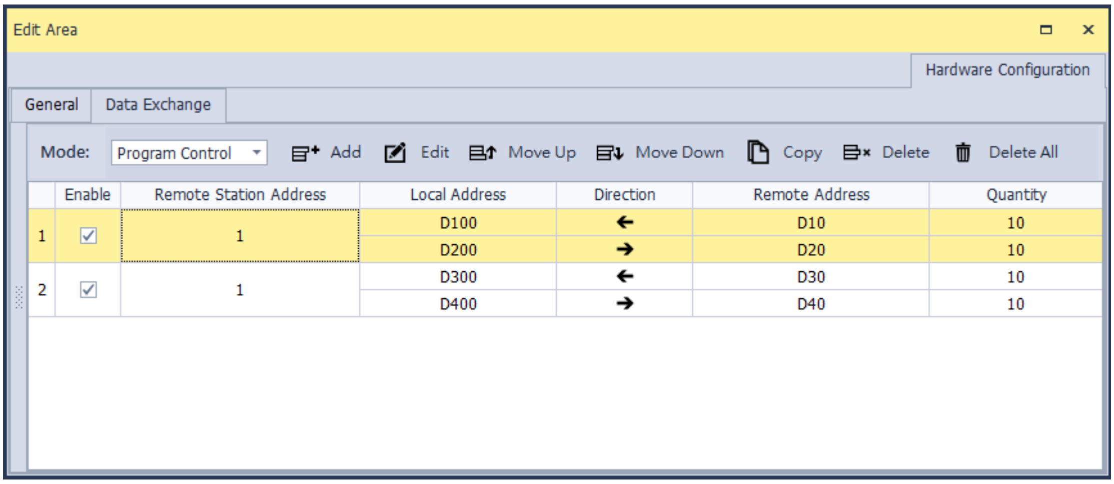
  Users can select the model of the slave to which the PLC will connect in the **Device Type** drop-down list box. They can select a standard Modbus TCP device or a Delta PLC. If they select a Delta PLC, they can use the registers in the Delta PLC when they set data blocks.

- **Input**

  Users can set the register in which the data read will be stored in the **Local Start Address** box. The register set can only be a D device. The users can set the register whose contents will be read in the **Remote Start Address** box. The register and the address which can be set depend on the device type selected in the **Device Type** drop-down list box. The users can set the quantity of data which will be read in the **Quantity** box. The unit used depends on the register type selected. 100 words (1600 bits) at most can be read. However, if the slave to which the PLC will connect is an AH500 series CPU module, 400 words (6400 bits) at most can be read.

- **Output**

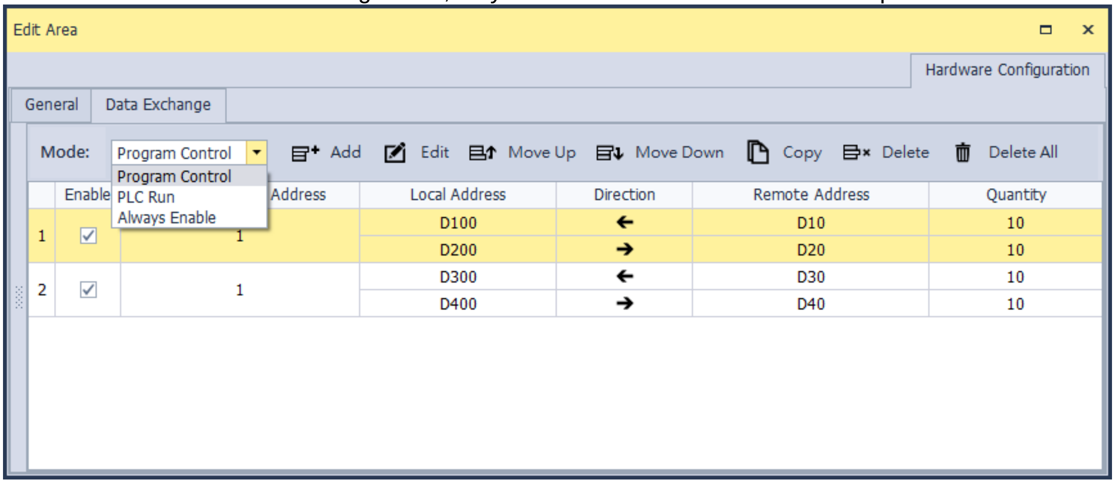
  Users can set the register whose contents will be written in the **Local Start Address** box. The register set can only be a D device. The users can set the register into which data will be written in the **Remote Start Address** box. The register and the address which can be set depend on the device type selected in the **Device Type** drop-down list box. The users can set the quantity of data which will be written in the **Quantity** box. The unit used depends on the register type selected. 100 words (1600 bits) at most can be written. However, if the slave to which the PLC will connect is an AH500 series CPU module, 400 words (6400 bits) at most can be written.



Users can manage the items in the table by using the function buttons on the top.

Button	Description
Move Up	Moving the item selected in the table upwards
Move Down	Moving the item selected in the table downwards
Delete	Deleting the item selected in the table
Copy	Copying the item selected in the table, and automatically adding the item which is copied to the bottom of the table

After the users create a data exchange table, they can select a mode in the **Mode** drop-down list box.



Mode	Description
Program Control	The execution of the data exchange is enabled or disabled by means of setting flags*2. If the flags are set to ON, the execution of the data exchange will be enabled.
PLC Run	When the PLC runs, the data exchange is executed.
Always Enable	The data exchange is executed whether the PLC runs or stops.

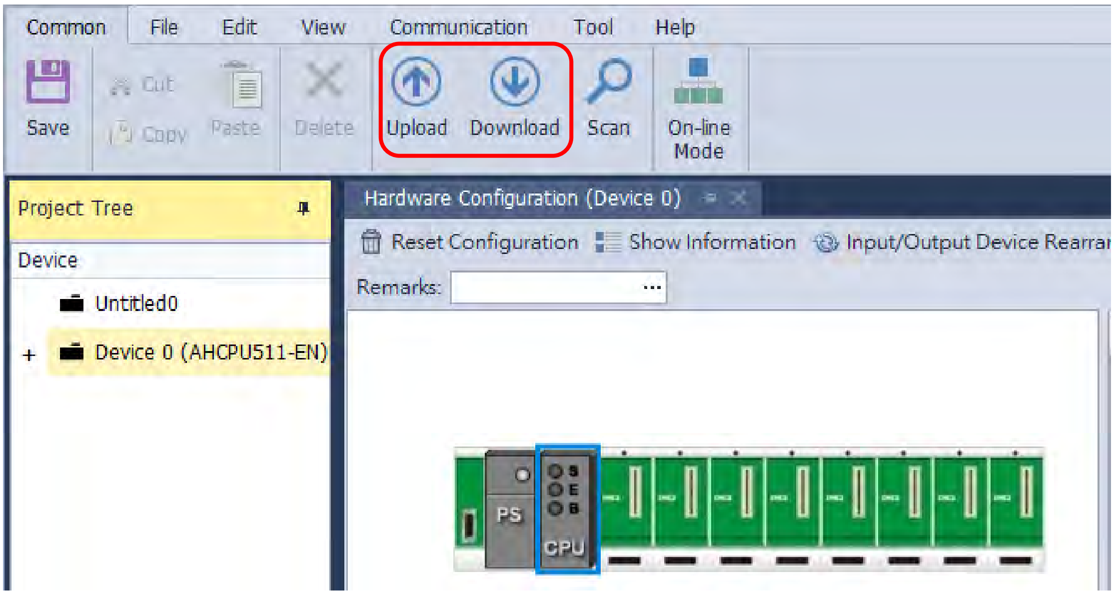
***1. The mode selected will be executed only if the Enable checkbox in the window used to set an item is selected.**

***2. Please refer to section 11.3.3 for more information about setting flags.**

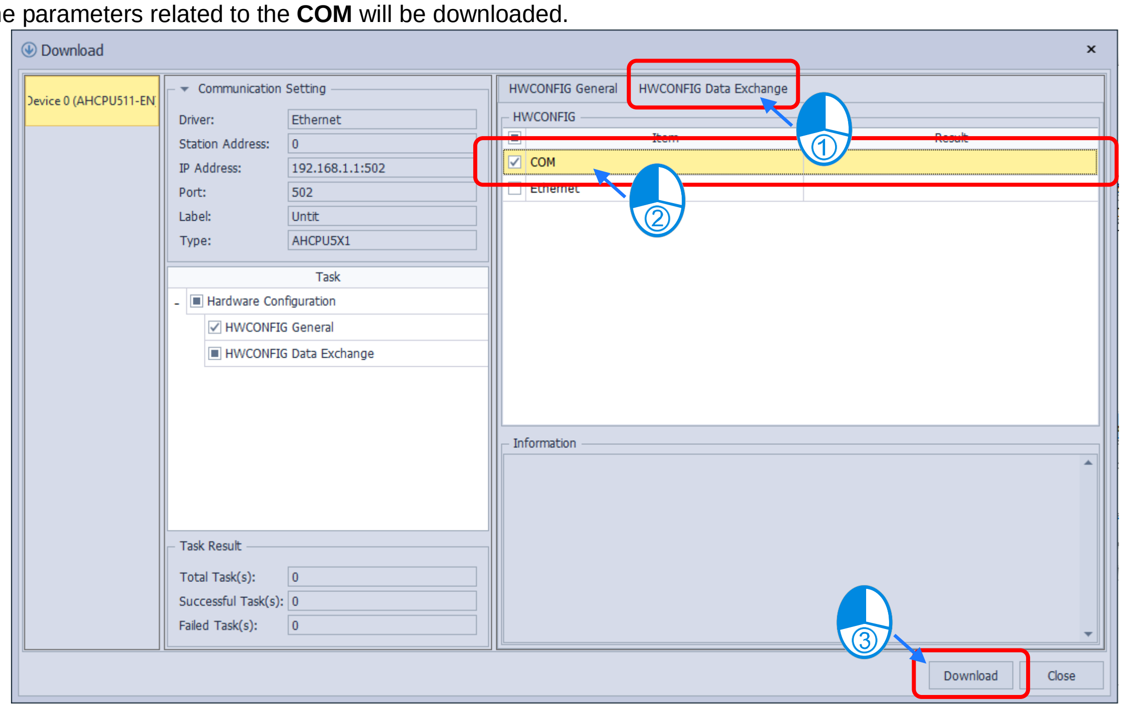
11.3.1.3 Modbus Data Exchange - Downloading / Uploading Parameters

After users set data exchange blocks, they have to download the parameters which are set to the PLC used. This section briefly introduces the downloading/uploading of the parameters set. Please refer to chapter 3 in ISPSoft User Manual for more information. Before the users download the parameters which are set, they have to make sure that ISPSoft connects to the PLC used normally. Please refer to section 2.4 in ISPSoft User Manual for more information.

After the users click , parameters set will be downloaded. After the users click , parameters in the PLC used will be uploaded.



After the users select the **COM** checkbox under the tab of **HWCONFIG Data Echange**, and click **Download**, the parameters related to the **COM** will be downloaded.



11.3.1.4 Modbus Data Exchange – Special Auxiliary Relays

Device	Name	R/W	Description
SM1424 ↓ SM1455	Data is being exchanged through COM1-Modbus connection Slave 1. ↓ Data is being exchanged through COM1-Modbus connection Slave 32.	R	ON: Data is being exchanged through COM1-Modbus connection Slave 1~32.
SM1456 ↓ SM1487	An error occurs when the data is being read by Slave 1 through COM1-Modbus connection. ↓ An error occurs when the data is being read by Slave 32 through COM1-Modbus connection.	R	ON: An error occurs when data is being read by Slave 1~32 through COM1-Modbus connection.
SM1488 ↓ SM1519	An error occurs when data is being written by Slave 1 through COM1-Modbus connection. ↓ An error occurs when data is being written by Slave 32 through COM1-Modbus connection.	R	ON: An error occurs when data is being written by Slave 1~32 through COM1-Modbus connection.
SM1520 ↓ SM1551	Data reading completed by Slave 1 through COM1-Modbus connection. ↓ Data reading completed by Slave 32 through COM1-Modbus connection.	R	ON: Data reading completed by Slave 1~32 through COM1-Modbus connection.
SM1552 ↓ SM1583	Data writing completed by Slave 1 through COM1-Modbus connection. ↓ Data writing completed by Slave 32 through COM1-Modbus connection.	R	ON: Data writing completed by Slave 1~32 through COM1-Modbus connection.
SM1598	Read and write at the same time through COM1-Modbus connection.	R/W	ON: Enable read and write at the same time through COM1-Modbus connection.
SM1599 ↓ SM1630	Enable data exchange through COM1-Modbus connection slave 1~32.	R/W	ON: Enable data exchange through COM1-Modbus connection slave 1~32.
SM1752 ↓ SM1783	Data is being exchanged through COM2-Modbus connection Slave 1. ↓ Data is being exchanged through COM2-Modbus connection Slave 32.	R	ON: Data is being exchanged through COM2-Modbus connection Slave 1~32.
SM1784 ↓ SM1815	An error occurs when the data is being read by Slave 1 through COM2-Modbus connection. ↓ An error occurs when the data is being read by Slave 32 through COM2-Modbus connection.	R	ON: An error occurs when data is being read by Slave 1~32 through COM2-Modbus connection.
SM1816 ↓ SM1847	An error occurs when data is being written by Slave 1 through COM2-Modbus connection. ↓ An error occurs when data is being written by Slave 32 through COM2-Modbus connection.	R	ON: An error occurs when data is being written by Slave 1~32 through COM2-Modbus connection.
SM1848 ↓ SM1879	Data reading completed by Slave 1 through COM2-Modbus connection. ↓ Data reading completed by Slave 32 through COM2-Modbus connection.	R	ON: Data reading completed by Slave 1~32 through COM2-Modbus connection.
SM1880 ↓ SM1911	Data writing completed by Slave 1 through COM2-Modbus connection. ↓ Data writing completed by Slave 32 through COM2-Modbus connection.	R	ON: Data writing completed by Slave 1~32 through COM2-Modbus connection.

11.3.2 Modbus TCP Data Exchange

11.3.2.1 Modbus TCP Data Exchange

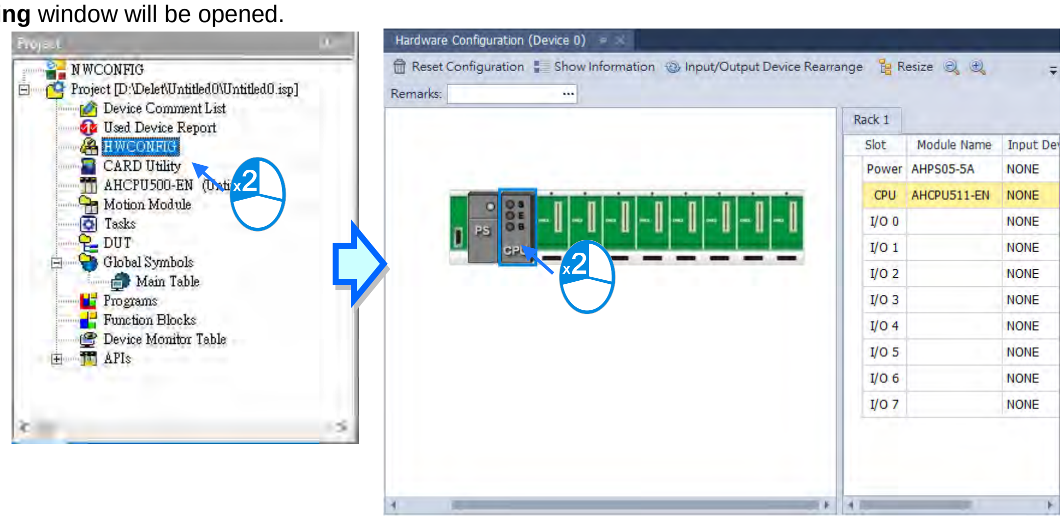
Data exchange between electronic devices can be achieved via Modbus TCP protocol. Through Modbus TCP protocol, users can exchange data among Delta devices and any 3rd party devices, as long as they comply with the Modbus TCP standard. A chart showing information concerning Modbus TCP data exchange is provided below.

Communication mode	Modbus TCP		
Maximum number of connections*1	AHCPU500-EN, AHCPU501-EN		16
	AHCPU510-EN, AHCPU511-EN		32
	AHCPU520-EN, AHCPU521-EN, AHCPU521-DNP		64
	AHCPU530-EN, AHCPU531-EN		128
Communication protocol	Standard Modbus TCP/IP and AH communication protocol		
Maximum quantity of data which can be read/written	Remote terminal unit	AH500 series CPU module	400 words 6400 bits
		DVP series PLCs	100 words 100 bits
		Others	100 words 100 bits
Supported devices	Remote terminal unit	AH500 series CPU module	X, Y, M, SM, SR, D, T, C, S, E
		DVP series PLCs	X, Y, M, D
		Others	Logical address 0x0000~0xFFFF
Supported models	AHCPU500-EN, AHCPU510-EN, AHCPU520-EN, AHCPU530-EN, AHCPU501-EN, AHCPU511-EN, AHCPU521-EN, AHCPU531-EN, AHCPU521-DNP		

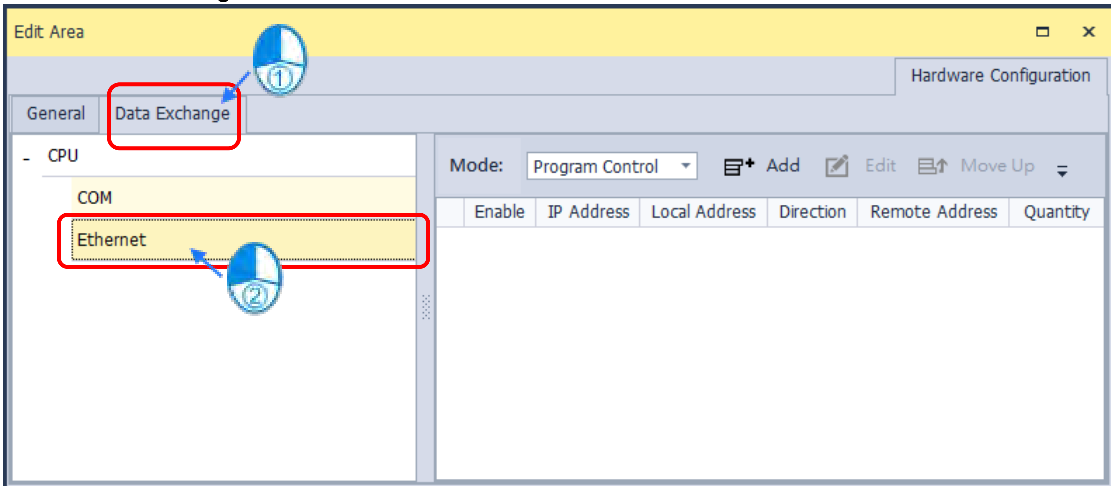
***1. The maximum number of connections is equal to the number of Modbus TCP data exchange blocks plus the number of Ether Link data exchange blocks. The number of Ether Link data exchange blocks in a PLC is the number of nodes of which the PLC demands data, and the nodes to which the PLC provides data are not counted.**

11.3.2.2 Modbus TCP Data Exchange - PLC Parameter Setting

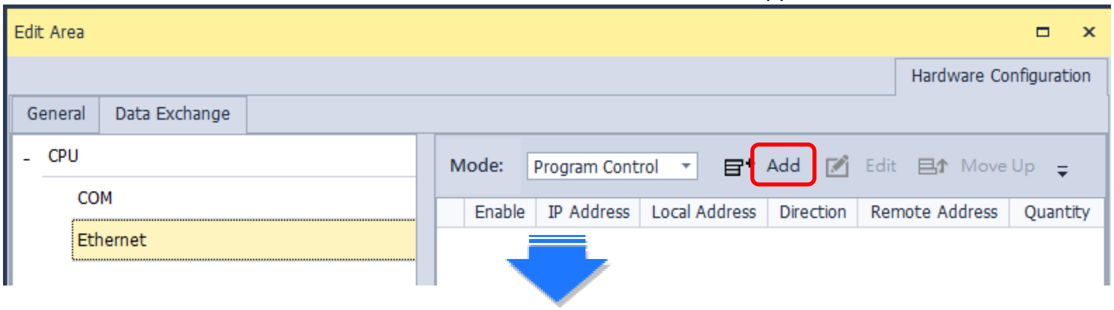
Double-click **HWCONFIG**, and then double-click **CPU**. After **CPU** is double-clicked, the **PLC Parameter Setting** window will be opened.

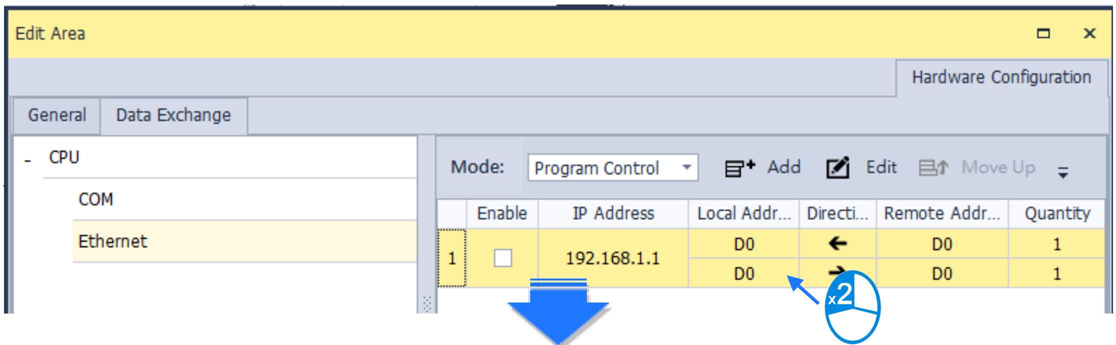


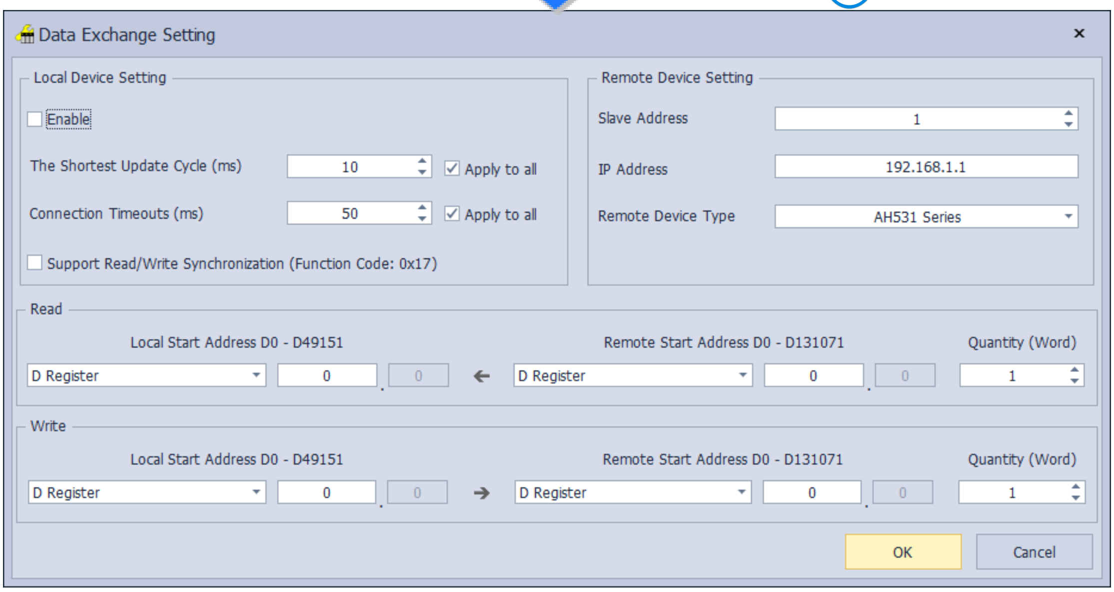
Click the **Data Exchange - COM**.



Since no data is set, there is a blank table in the **Data Exchange** section. After **Add** is clicked, an item will be inserted. After the item is double-clicked, the **Item 1** window will appear.







The **Item 1** window is described below.

- **Enable**
  If users want to make the PLC execute the data exchange, they have to select the **Enable** checkbox. If the users want to stop the data exchange temporarily, they can leave the **Enable** checkbox unselected.

- **IP Address**
  Users have to type the IP address of the slave to which the PLC will connect in the **IP Address** box.

- **The Shortest Update Cycle (ms)**
  Users have to set the shortest cycle of updating the data exchange. A millisecond is a unit of time. When the data exchange is executed, it is updated at specific intervals. However, if the data exchange is prolonged due to network congestion or other reasons, it will be updated according to the actual situation.

- **Connection Timeout (ms)**
  Users can set the longest time that is allowed to elapse before the data exchange is executed. A millisecond is a unit of time. If the data exchange is not executed after the longest time set elapses, a connection timeout will occur. The PLC still tries to connect to the slave station selected at specific intervals. Once the PLC connects to the slave station selected, the data exchange will be executed.

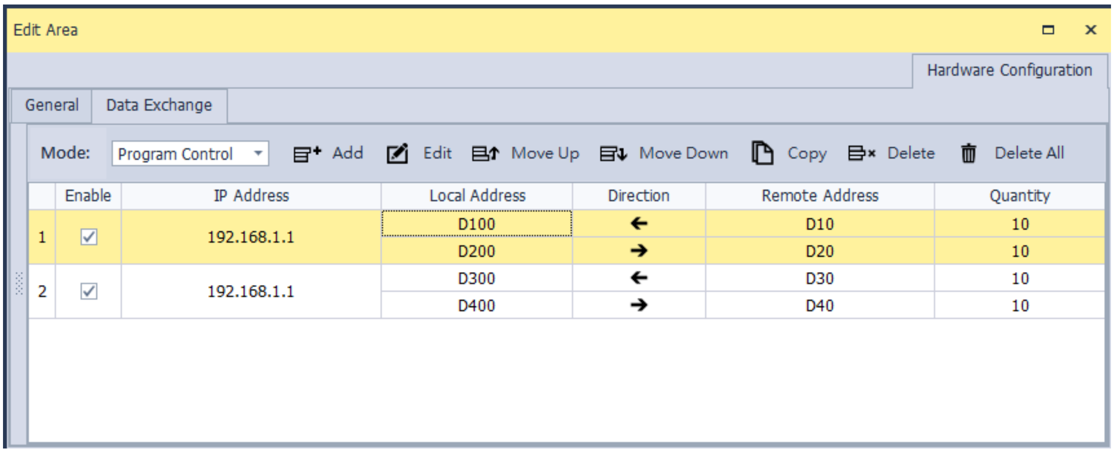
- **Support read/write synchronization (Function code 0x17)**
  If the slave to which the PLC will connect can complete reading and writing simultaneously (Modbus function code 0x17), users can select the **Support read/write synchronization (Function code 0x17)** checkbox. After the **Support read/write synchronization (Function code 0x17)** checkbox is selected, the PLC will read data and write data simultaneously, and the efficiency in exchanging data will increase.

- **Device Type**
  Users can select the model of the slave to which the PLC will connect in the **Device Type** drop-down list box. They can select a standard Modbus TCP device or a Delta PLC. If they select a Delta PLC, they can use the registers in the Delta PLC when they set data blocks. When selecting a 3rd party device, they can select Modbus Register Hex from the Remote Start Address (Hex) drop-down list and define a hexadecimal 4-digit Modbus absolute positon.

- **Input**
  Users can set the register in which the data read will be stored in the **Local Start Address** box. The register set can only be a D device (not limited to AH500 advanced CPU series: AHCPU501/511/521/531). The users can set the register whose contents will be read in the **Remote Start Address** box. The register and the address which can be set depend on the device type selected in the **Device Type** drop-down list box. The users can set the quantity of data which will be read in the **Quantity** box. For AH500 basic CPU series (AHCPU500/510/520/530), the unit used depends on the remote register type selected. 100 words (1600 bits) at most can be read. However, if the slave to which the PLC will connect is an AH500 series CPU module, 400 words (6400 bits) at most can be read. As for AH500 advanced CPU series (AHCPU501/511/521/531), users can select the register type according to the requirements.

- **Output**
  Users can set the register whose contents will be written in the **Local Start Address** box. The register set can only be a D device (not limited to AH500 advanced CPU series: AHCPU501/511/521/531). The users can set the register into which data will be written in the **Remote Start Address** box. The register and the address which can be set depend on the device type selected in the **Device Type** drop-down list box. The users can set the quantity of data which will be written in the **Quantity** box. For AH500 basic CPU series (AHCPU500/510/520/530), the unit used depends on the remote register type selected. 100 words (1600 bits) at most can be written. However, if the slave to which the PLC will connect is an AH500 series CPU module, 400 words (6400 bits) at most can be written. As for AH500 advanced CPU series (AHCPU501/511/521/531), users can select the register type according to the requirements.

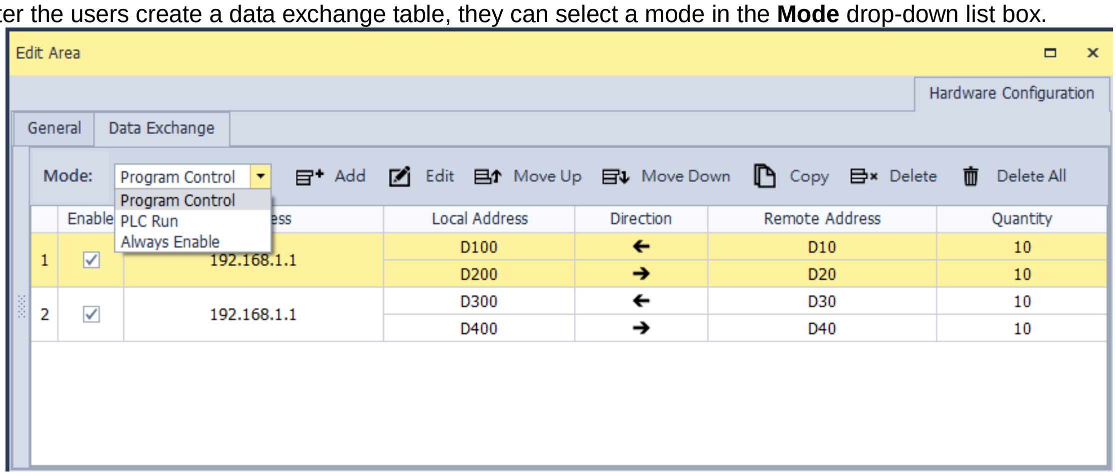
  When users set a data exchange block, the local register set can only be a word device, and the remote register set can be a bit device. If the remote register set is a bit device, the device number of the remote register does not need to end with 0. For example, the remote register set can be D0.3. If the data which will be read or written is not composed of words, the local PLC will exchange bits with the remote PLC selected, and the bits which are not involved in the data exchange will remain unchanged. For example, if D0~D1 in the local PLC read M0~M19 in the remote PLC selected, the data read will be stored in D0.0~D1.3, and D1.4~D1.5 will remain unchanged. As for AH500 advanced CPU series (AHCPU501/511/521/531), users can select the register type according to the requirements.



Users can manage the items in the table by using the function buttons on the top.

Button	Description
Move Up	Moving the item selected in the table upwards
Move Down	Moving the item selected in the table downwards
Delete	Deleting the item selected in the table
Copy	Copying the item selected in the table, and automatically adding the item which is copied to the bottom of the table

After the users create a data exchange table, they can select a mode in the **Mode** drop-down list box.



Mode	Description
Program Control	The execution of the data exchange is enabled or disabled by means of setting flags*2. If the flags are set to ON, the execution of the data exchange will be enabled.
PLC Run	When the PLC runs, the data exchange is executed.
Always Enable	The data exchange is executed whether the PLC runs or stops.

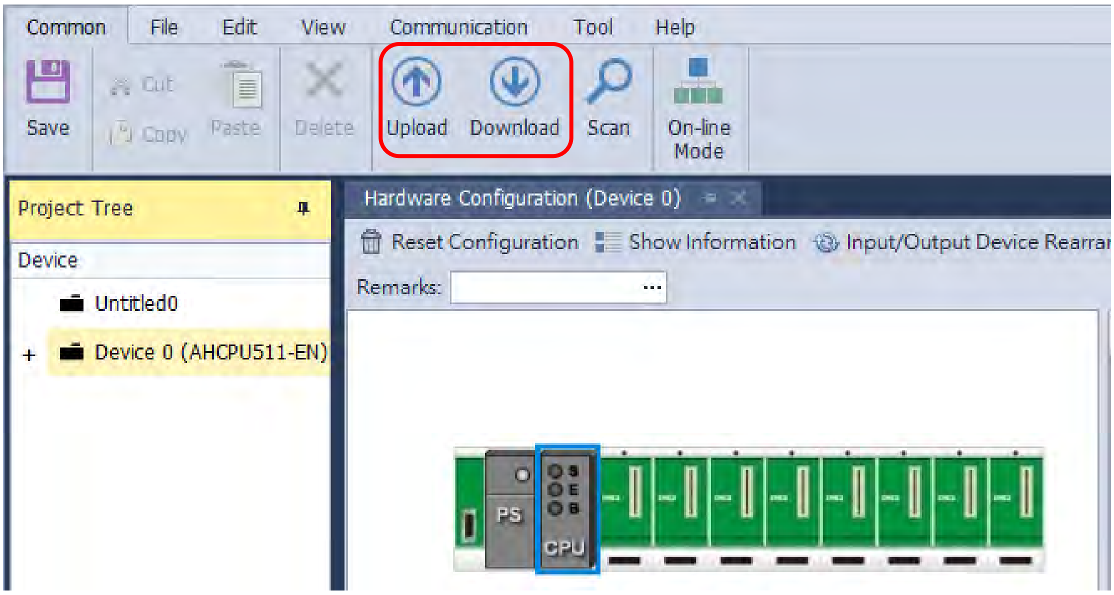
***1. The mode selected will be executed only if the Enable checkbox in the window used to set an item is selected.**

***2. Please refer to section 11.3.3 for more information about setting flags.**

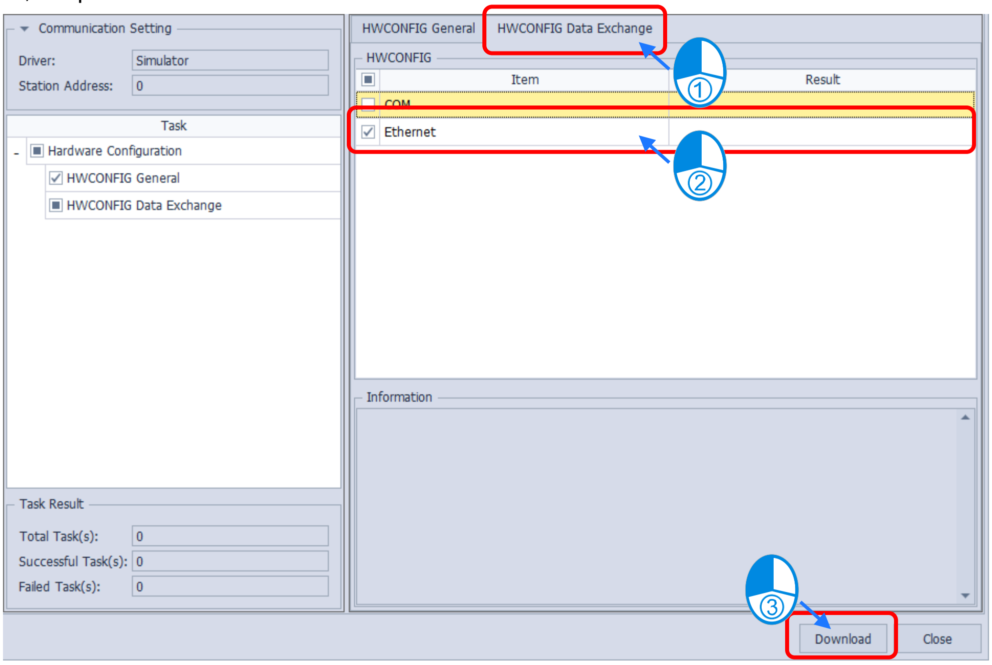
11.3.2.3 Modbus TCP Data Exchange - Downloading / Uploading Parameters

After users set data exchange blocks, they have to download the parameters which are set to the PLC used. This section briefly introduces the downloading/uploading of the parameters set. Please refer to chapter 3 in ISPSoft User Manual for more information. Before the users download the parameters which are set, they have to make sure that ISPSoft connects to the PLC used normally. Please refer to section 2.4 in ISPSoft User Manual for more information.

After the users click , parameters set will be downloaded. After the users click , parameters in the PLC used will be uploaded.



After the users select the **Ethernet** checkbox under the tab of **HWCONFIG Data Echange**, and click **Download**, the parameters related to the **Ethernet** will be downloaded.



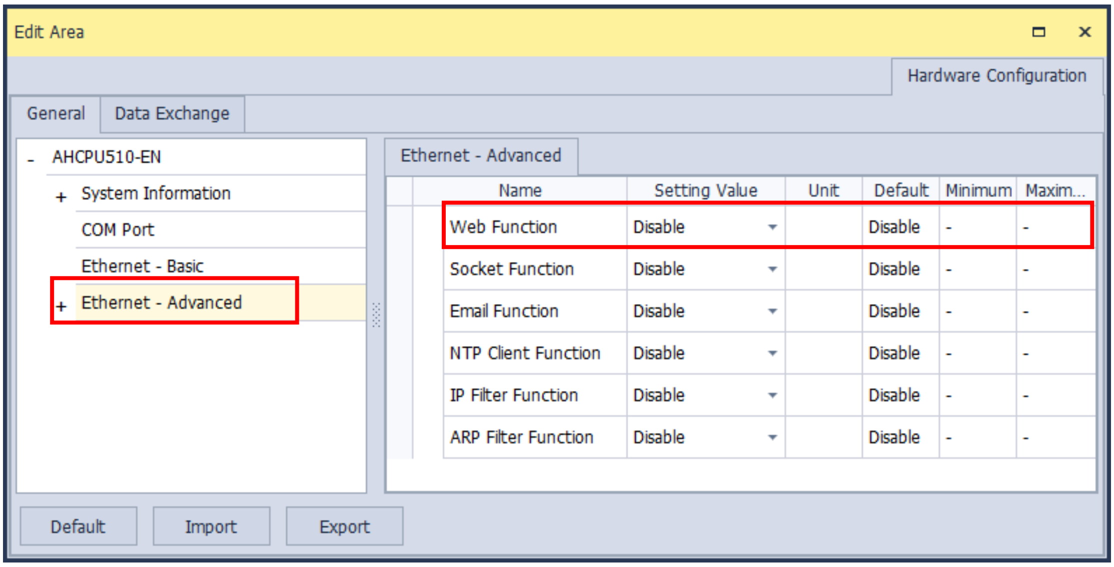
11.3.2.4 Modbus TCP Data Exchange – Special Auxiliary Relays

Device	Name	R/W	Description
SM700 ↓ SM827	Enable the execution of data exchange through Modbus TCP connection 1~128	R/W	ON: Enable the execution of data exchange through Modbus TCP connection 1~128
SM828 ↓ SM955	Error flag of data exchange through Modbus TCP connection 1~128	R/W	ON: Error flag of data exchange through Modbus TCP connection 1~128
SM1089	The connection quantity of Modbus TCP Server has reached its maximum.	R	ON: The connection quantity of Modbus TCP Server has reached its maximum.

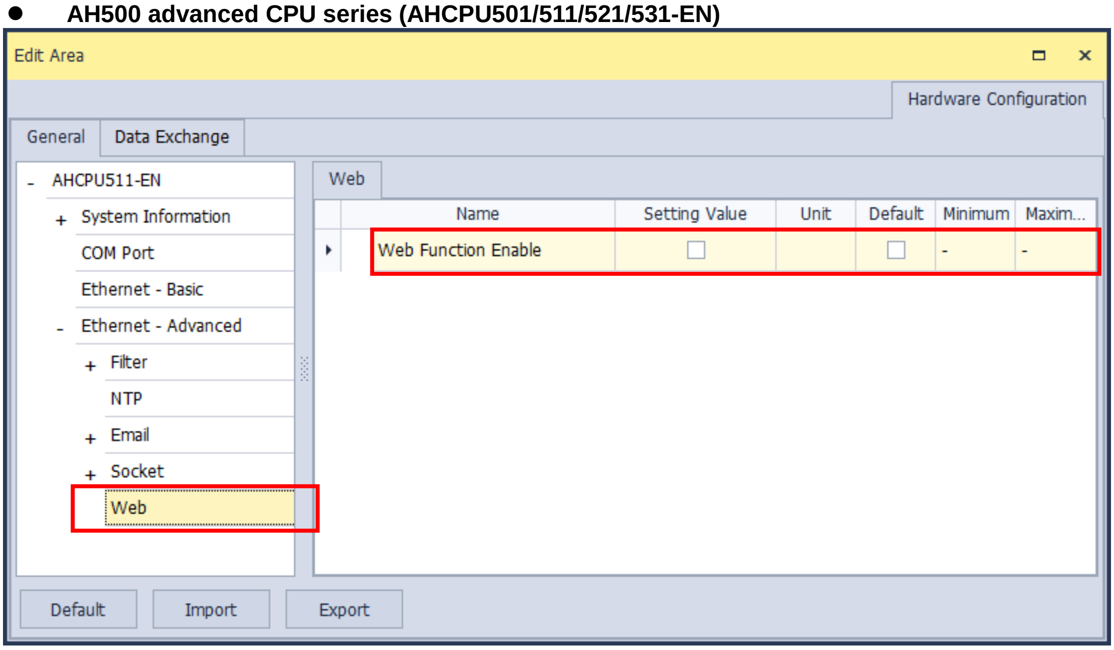
11.4 Web

11.4.1 Enabling Web Function in AH500 Series

- **AH500 basic CPU module series (AHCPU500/510/520/530-EN).**



- **AH500 advanced CPU series (AHCPU501/511/521/531-EN)**



11.4.2 Introduction

AHCPU5XX-EN is equipped with a web monitoring function. Users can view information (such as the I/O table, devices, system logs, setting values) in AHCPU5XX-EN through a web browser, e.g. Internet Explorer.
Note: this function is only available for AH5x0-EN (FW V1.08 or later) and AH5x1-EN (FW V2.03 or later).

11.4.3 Exploring the Webpage

You can enter AH Series PLC IP address in the search bar of your browser to connect to your device. After that you can set up and monitor AH Series PLC.

11.4.3.1 Webpage

After connected to the module, you can see the AH500 webpage with 5 sections as the image shown below.

Descriptions:

Section	Contents
Banner	Delta logo and the name of the connected device
Login	Username and password
Menu	Sitemap is shown in tree diagram. (The menu shows data based on the permission of the current user.)
Context	Main contents; click an item on the menu section, its content appears here.
Bottom	Copyright information and Delta webpage information

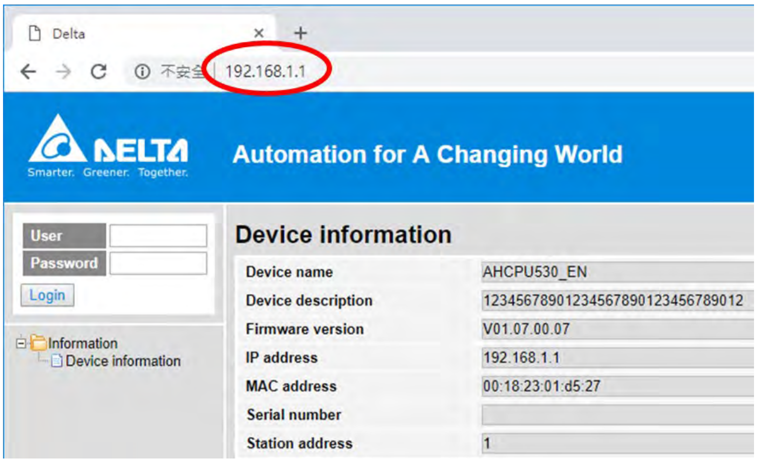
11.4.3.2 Using the Webpage

List of browsers that support AH500 webpage:

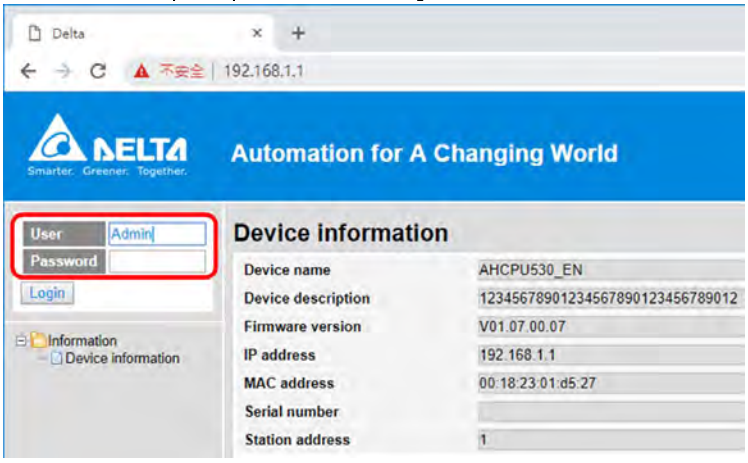
Provider	Browser	Supported versions
Microsoft	Internet Explorer	V10.0 and later
Microsoft	Edge	V20 and later
Google	Chrome	V14 and later
Mozilla	Firefox	V17 and later
Apple	Safari	V5.1 and later

- **Operation Steps:**

a. Open your browser, enter AH500 PLC IP address in the search bar.



b. After the webpage appears, enter “Admin” in the User section and click Login without entering any password. You can set up the password after login.

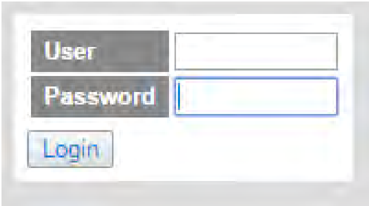


11.4.3.3 Login

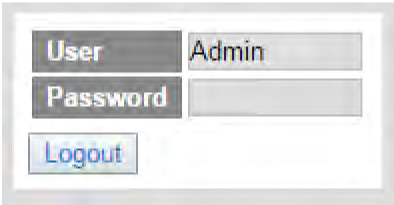
You need to login to your account to set up.

- **Operation Steps:**

  a. Provide the login information to login.



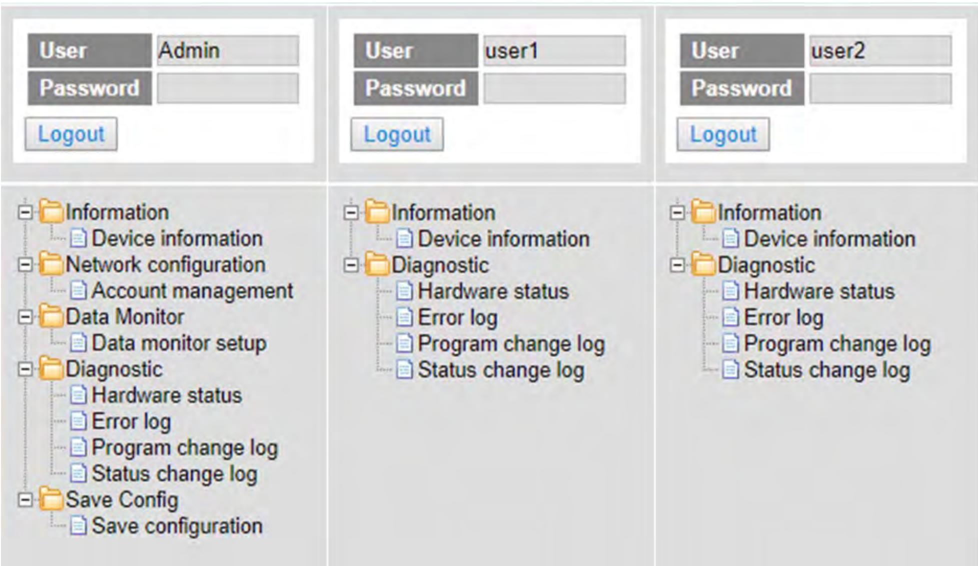
  b. After login successfully, the user field shows your account name (read only). After setting up, you can click **Logout** here to leave this webpage.



Item	Description
User	Your account name
Password	Your password
"Login" / "Logout"	Login: to enter the webpage Logout: to leave the webpage

11.4.3.4 Menu

The menu shows data based on the permission of the current user.

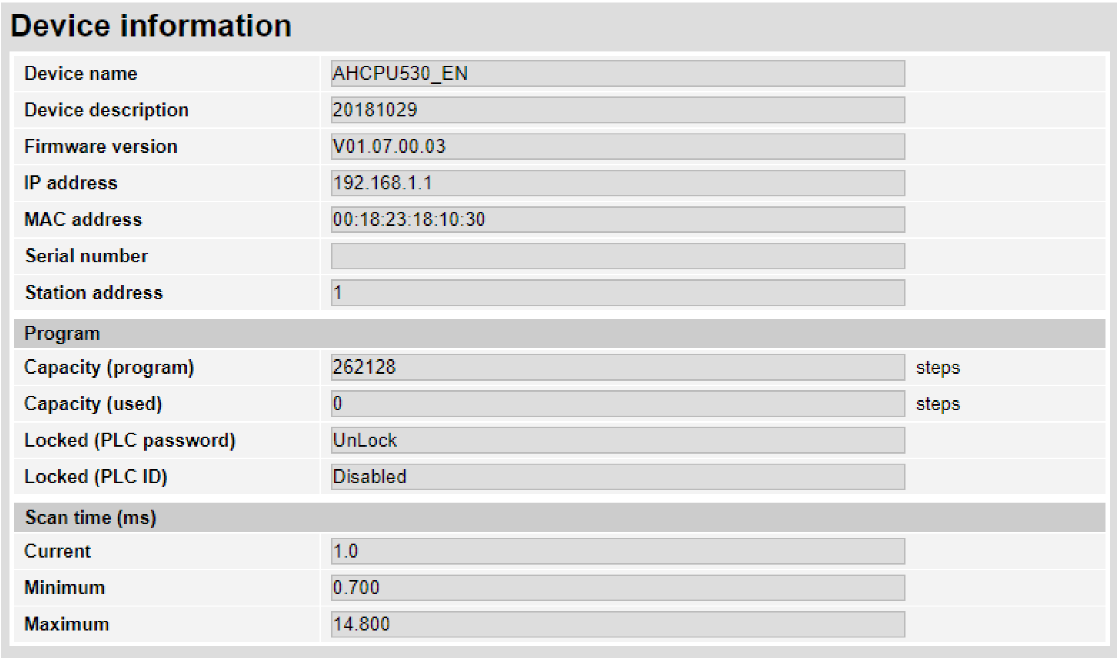


Nodes	Permission		
	Administrator	Write/Read	Read
Device information	V	V	V
Account management	V		
Data monitor setup	V		
Data monitor table 1 ~ 4	V	V	Read-only
Hardware status	V	Read-only	Read-only
Error log	V	V	V
Program change log	V	V	V
Status change log	V	V	V
Save configuration	V		

11.4.4 Device Information

Here provides AH Series PLC product information.

You do not need to log in to see the device information. This page is read only, not for editing.



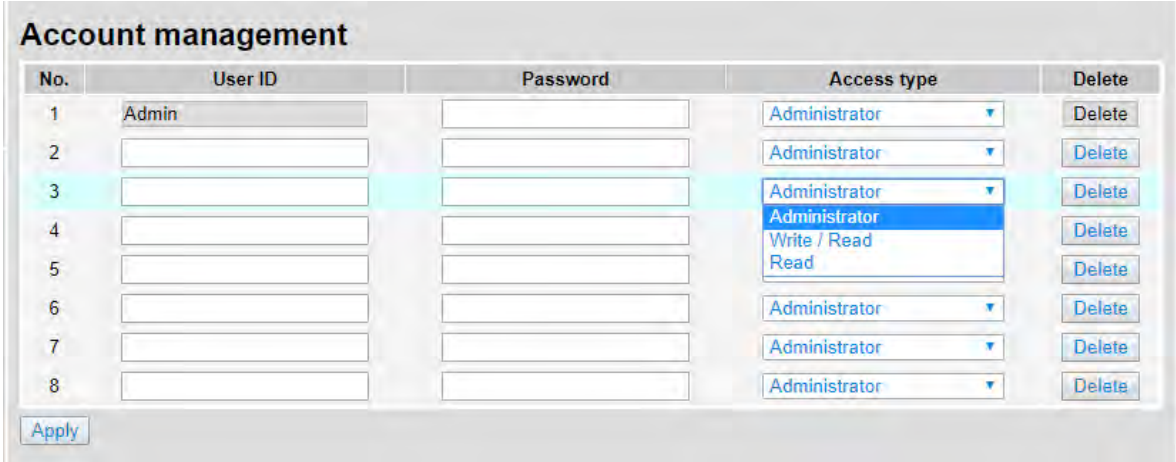
Item	Description
Device name	Product name (read-only)
Device description	Device description that user defined in ISPsoft (read-only)
Firmware version	Firmware version (read-only)
IP address	Product IP address (read-only)
MAC address	Product MAC address (read-only)
Serial number	Product serial number (read-only)
Station address	Product station address (read-only)
Capacity (program)	Maximum program capacity (read-only)
Capacity (used)	Current used program capacity (read-only)
Locked (PLC password)	PLC is password-protected. (read-only)
Locked (PLC ID)	PLC ID
Scan time-Current	Current scan time (read-only)
Scan time-Minimum	Minimum scan time (read-only)
Scan time-Maximum	Maximum scan time (read-only)

11.4.5 Network configuration

You can set network related configurations here.

11.4.5.1 Account management

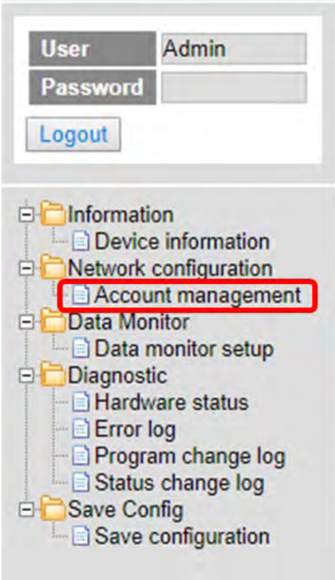
You can set 3 kinds of access types for up to 8 user accounts.



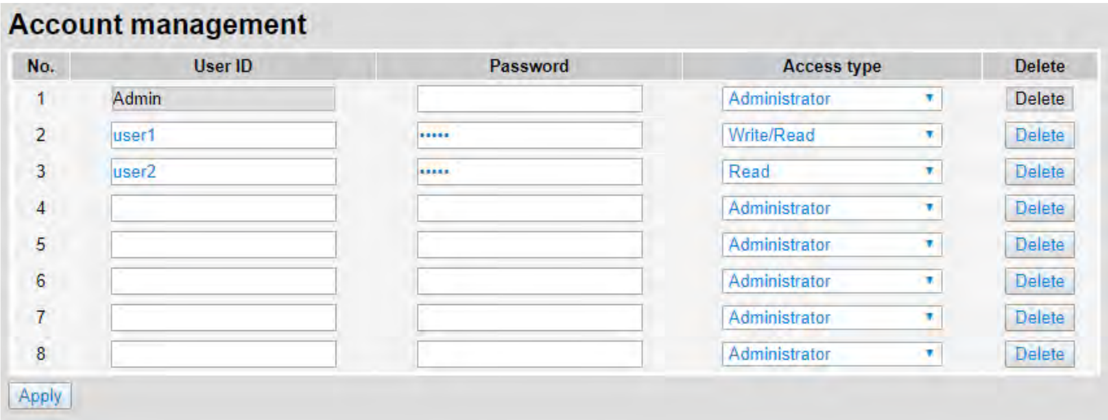
Item	Description
User ID	To name your user ID, you can use up to 16 characters from the following characters, A through Z (case-insensitive), 0 through 9, _ (underscore) , (comma) and . (dot) . ● The first default user ID is “Admin” (read only).
Password	To name your password, you can use up to 16 characters from the following characters, A through Z (case-insensitive), 0 through 9, _ (underscore) , (comma) and . (dot) . ● No password for the default user ID “Admin” (read only), you can set up the password later.
Access type	Administrator: You can set up all parameters and have permission to edit the password and permission. Write/Read: You can open the data monitor pages and the diagnostic page. You can also edit the parameters. Read: You can open the data monitor pages and the diagnostic page. But you cannot edit parameters. ● Default user is “Administrator”.
“Delete”	Use “Delete” to clear the user ID and password.
“Apply”	Use “Apply” to save the settings.

- **Operation Steps:**

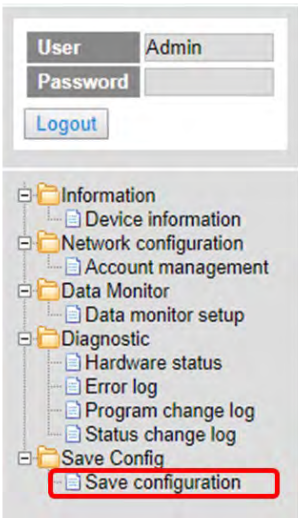
a. After log in, double-click **Account management** to open the setting page.



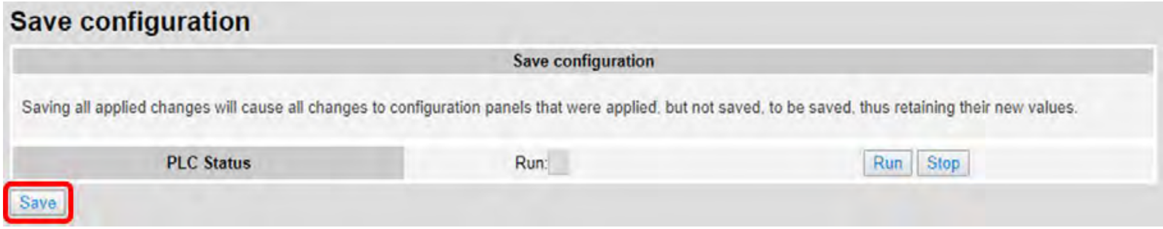
b. Set up the User ID, the password and the access type. After editing, click “Apply” to save the setting or click “Delete” to clear the account.



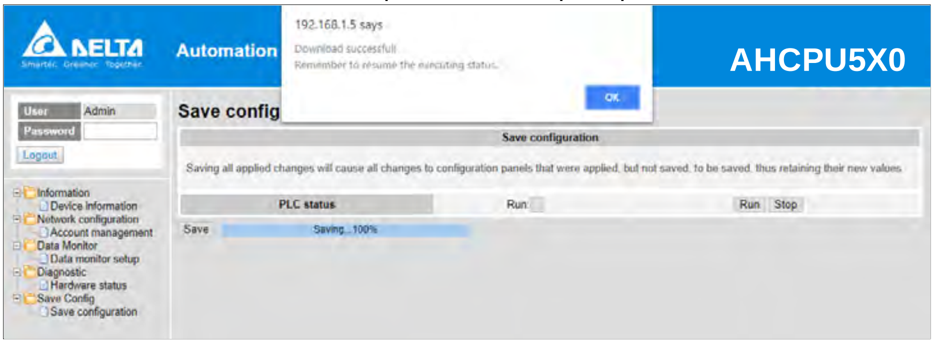
c. Double-click **Save configuration** to open the setting page.



d. Click “Save” to save and download the settings to the device.



e. After download is complete, it will be prompted with a Download successful message.

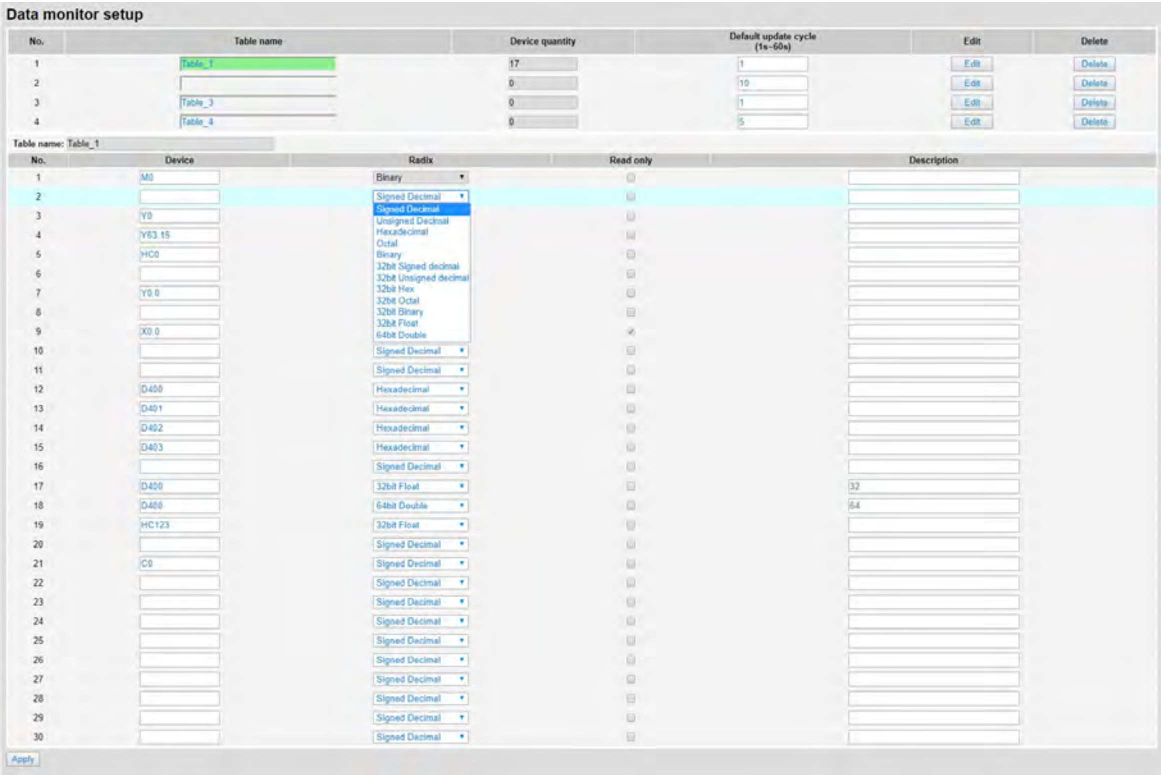


11.4.6 Data Monitoring

You can set monitoring related configurations here.

11.4.6.1 Data Monitoring Setup Page

You can set up 4 pages of monitoring data and up to 30 items can be monitored on each page.

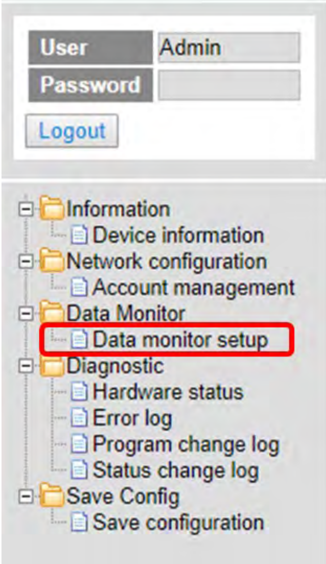


Item	Description
Table name	To name your table, you can use up to 16 characters from the following characters, A through Z (case-insensitive), 0 through 9, _ (underscore) , (comma) and . (dot) .
Device quantity	Device quantity to be monitored; default: read only
Default update cycle	Set up the updated cycle time; default: 5 seconds; unit: second
“Edit”	Click “Edit” to edit the table and the table name column turns green. The table contents appear below.
“Delete”	Click “Delete” to delete the table and its contents.
Device	Devices to be monitored; you can enter the following devices to monitor xX, yY, mM, sSmM, sSrR, dD, sS, tT, cC, hHcC, eE and IL.
Radix	Positional numeral system to be shown on the monitoring page; available formats are Signed decimal, Unsigned decimal, Hexadecimal, Octal, Binary, 32bit Signed decimal, 32bit Unsigned decimal, 32bit Hexadecimal, 32bit Octal, 32bit Binary, 32bit Float and 64bit Double
Read only	Set up the monitored devices to read only or not.

Item	Description
Description	Add a description here for the table.
"Apply"	Click "Apply" to save the settings.

- **Operation Steps:**

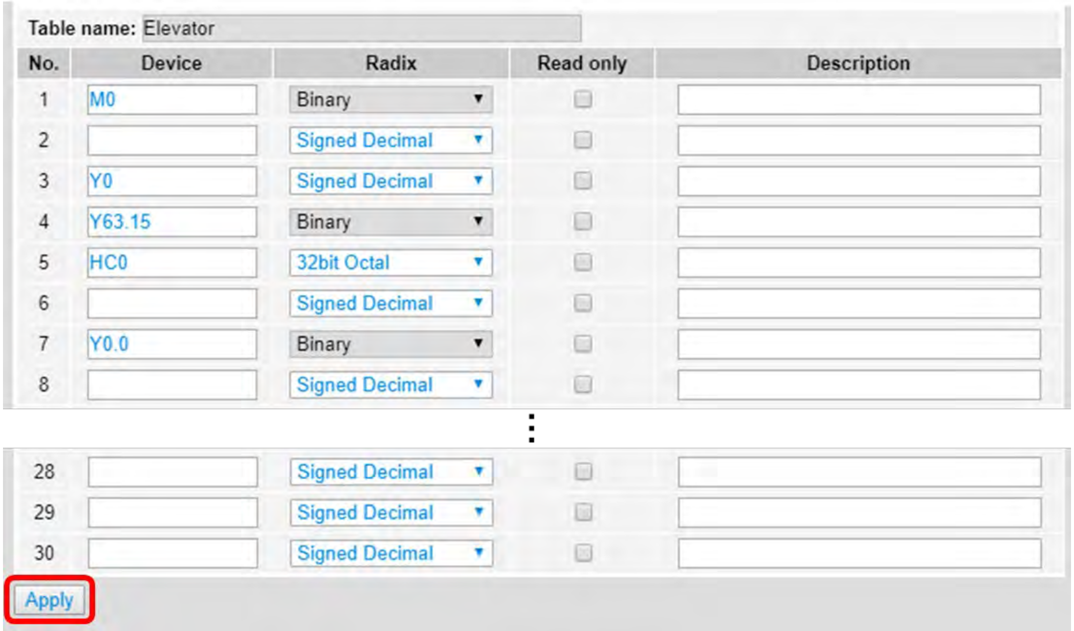
a. After log in, double-click **Data monitor setup** to open the setting page.



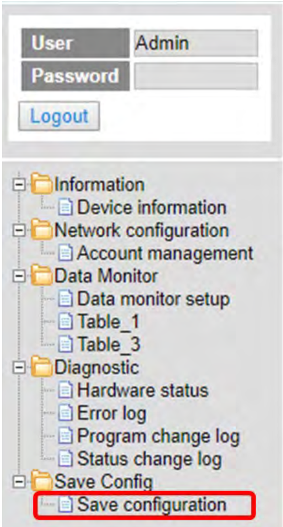
b. Use "Edit" to edit the table name, device quantity, and update cycle time.

c. The corresponding table contents appear below.

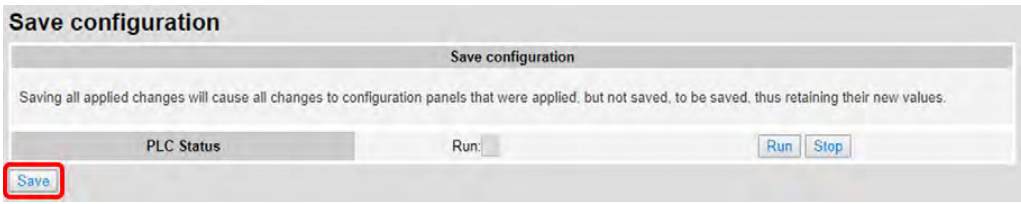
d. Edit the devices to be monitored, radix to be shown, read only or not and the description. After editing, click “Apply” to save the setting.



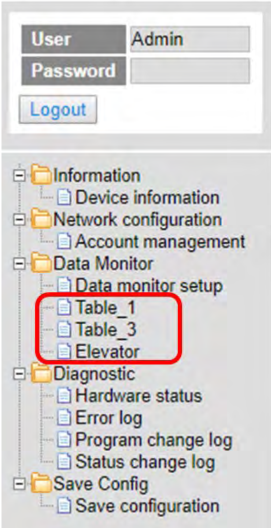
e. Double-click **Save configuration** to open the setting page.



f. Click “Save” to save and download the settings to the device.



g. Once the download is complete, you can see the newly added table to be monitored under the Data Monitor node.



h. Note: The data monitor table must be downloaded to the device otherwise even if the data monitor table is created, it cannot be monitored.

11.4.6.2 Data Monitor Table Pages

The setting results are shown as below.

Table name: Table_1 Monitor status: Update cycle (1s ~ 60s): - 1 + Floating Format Setting: 3

No.	Device	Status	Value	Radix	Description	Set Status	Set value	Set
1	M0			Binary		ON OFF		Set
2						ON OFF		Set
3	Y0		K57	Signed Decimal		ON OFF	57	Set
4	Y63.15			Binary		ON OFF		Set
5	HC0		O00000000000	32bit Octal		ON OFF		Set
6						ON OFF		Set
7	Y0.0			Binary		ON OFF		Set
8						ON OFF		Set
9	X0.0			Binary		ON OFF		Set
10						ON OFF		Set
11						ON OFF		Set
12	D400		H3576	Hexadecimal		ON OFF		Set
13	D401		H4641	Hexadecimal		ON OFF		Set
14	D402		H8000	Hexadecimal		ON OFF		Set
15	D403		H404B	Hexadecimal		ON OFF		Set
16						ON OFF		Set
17	D400		12365.365	32bit Float	32	ON OFF		Set
18	D400		55.000	64bit Double	64	ON OFF		Set

Item	Description
Table name	Name of the table; read only
Monitor status	Status of the monitoring; read only Yellow light: reading, Green light: reading complete, Red light: reading error
Update cycle	Update cycle time; default is what you set up in data monitor setup page; unit: second
"-"	Minus; click once to decrease 1; the minimum value is 1
"+"	Plus; click once to increase 1; the maximum value is 60

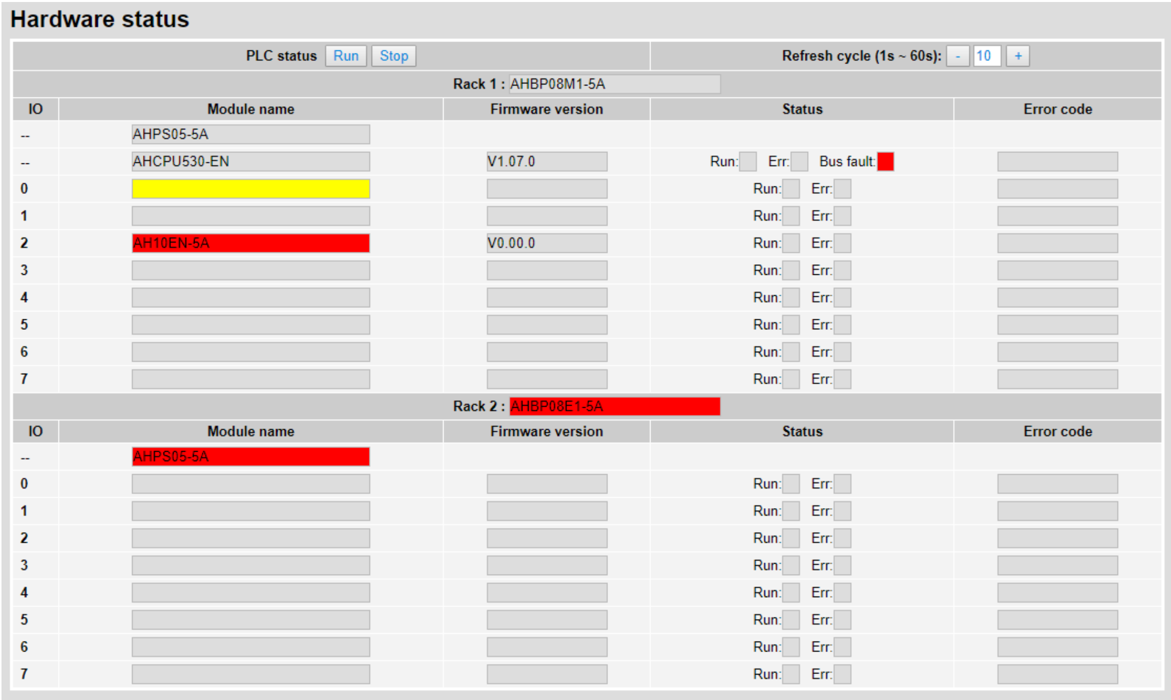
Item	Description
Floating format setting	Floating point setting; round down; default: round the number down to three decimal places
Device	Devices to be monitored; read only
Radix	Positional numeral system to be shown on the monitoring page; available formats are Signed decimal, Unsigned decimal, Hexadecimal, Octal, Binary, 32bit Signed decimal, 32bit Unsigned decimal, 32bit Hexadecimal, 32bit Octal, 32bit Binary, 32bit Float and 64bit Double
Description	Add a description here for the table; read only
Status	Status of bit; read only Green LED: ON; No LED: OFF
Value	Values in devices to be monitored; read only Signed decimal: K+ Number Unsigned decimal: K+ Number Hexadecimal: H + hex Number Octal: O + octal Number Binary: B + binary Number 32bit Signed decimal: K+ Number 32bit Unsigned decimal: K+ Number 32bit Hexadecimal: H + hex Number 32bit Octal: O + octal Number 32bit Binary: B + binary Number 32bit Float: float Number 64bit Double: float Number
“On” / ”Off”	“ON”: the status of Bit is ON. “OFF”: the status of Bit is OFF. ● If the authority level for the logged in user is READ, this column is read only.
Set Value	Change the value for the device to be monitored ● Type the value in and click “SET” and the changed value appears in the VALUE column as the image shown above. ● If the authority level for the logged in user is READ, this column is read only.
“Set”	Click “Set” to confirm the changed value. ● If the authority level for the logged in user is READ, this column is read only.

11.4.7 Diagnostic

You can set diagnostic related configurations here.

11.4.7.1 Hardware Status Page

This page displays information on hardware status, CPU module, power module and IO modules. You can set CPU to run or stop. Here also shows the running status and error codes of the PLC CPU and its connected modules.

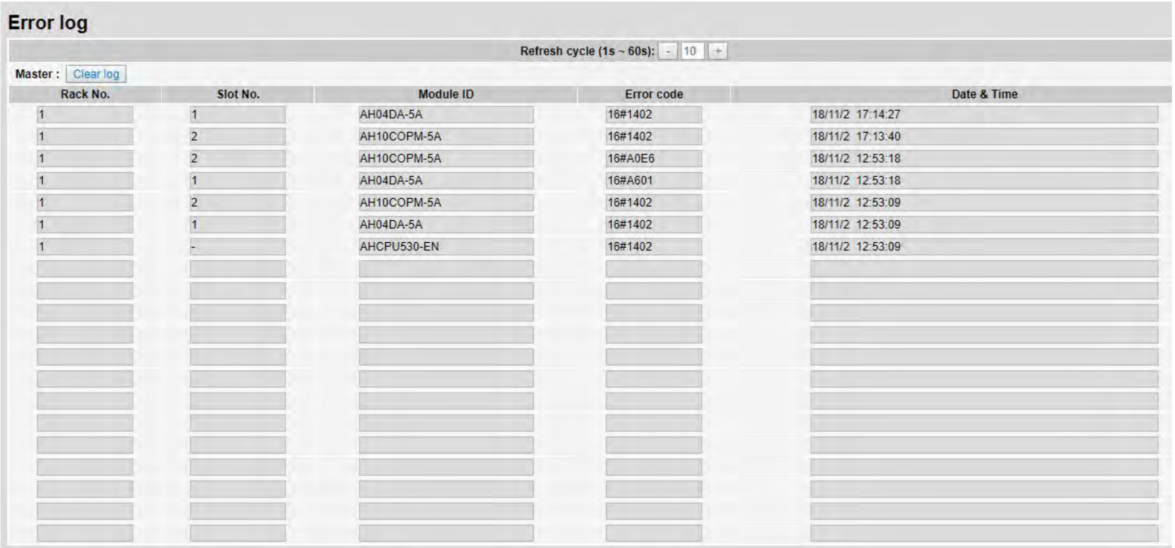


Item	Description
“Run” / “Stop”	Click “RUN” to set the running status to RUN Click “Stop” to set the running status to STOP ● If the authority level for the logged in user is WRITE/READ or READ, this column is read only.
Refresh cycle	Refresh cycle time; default: 10; unit: second
“-“	Minus; click once to decrease 1; the minimum value is 1
“+“	Plus; click once to increase 1; the maximum value is 60
Rack M name	Name of the rack; read only Name of the module; read only When the actual placement is not the same as the arrangement in HWCONFIG, the background of this column will be in red. When there is a not-yet-configured module detected, the background of this column will be in yellow.
Rack 1~M Module name first section	Name of the power module; read only When the actual placement is not the same as the arrangement in HWCONFIG, the background of this column will be in red. When there is a not-yet-configured module detected, the background of this column will be in yellow.

Item	Description
Rack 1 Module name second section	Name of the module; read only
CPU Firmware version	PLC CPU firmware version; read only
CPU Run LED	LED of PLC CPU running status; read only Green Light: RUN LED Not Lit: STOP
CPU Error LED	LED of PLC CPU error status; read only Red Light: Error Yellow Light: Warning LED Not Lit: No error
CPU Bus Fault LED	LED of PLC CPU Bus Fault; read only Red Light: Bus Fault Yellow Light: Bus Fault warning LED Not Lit: No Bus Fault
CPU Error code	CPU error code; read only
Rack M's Slot N Module name	Name of the module; read only When the actual placement is not the same as the arrangement in HWCONFIG, the background of this column will be in red. When there is a not-yet-configured module detected, the background of this column will be in yellow.
Rack M's Slot N Module Run LED	LED of module running status; read only Green light: RUN LED Not Lit: STOP
Rack M's Slot N Module Error LED	LED of module error; read only Red Light: Error LED Not Lit: No error
Rack M's Slot N Module Error code	Error codes of module; read only

11.4.7.2 Error Log Page

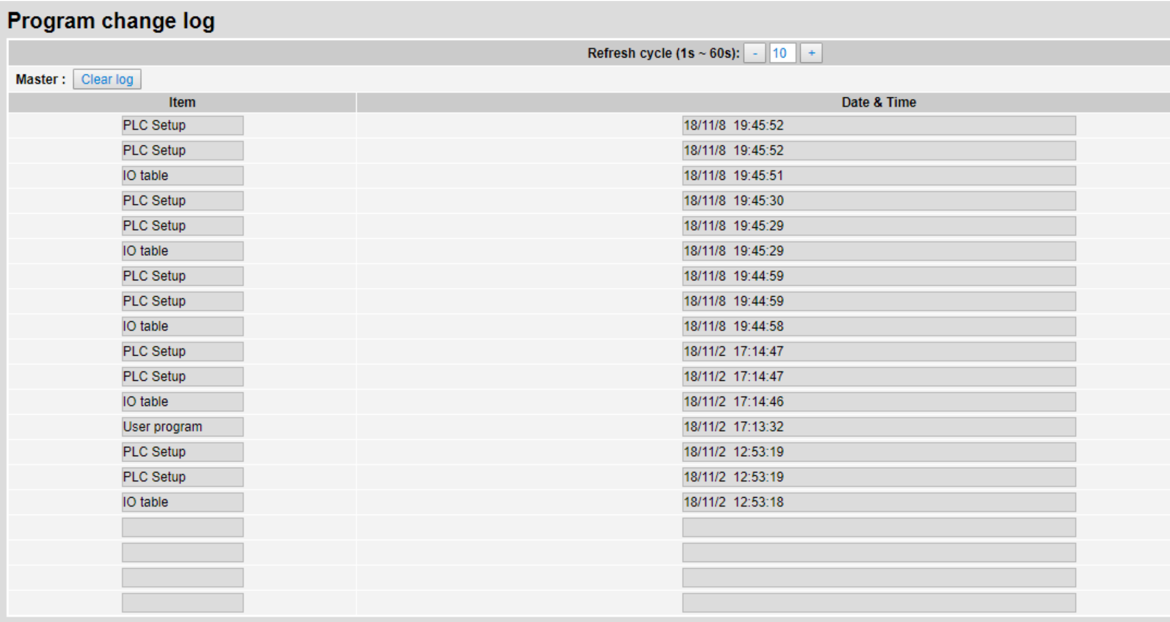
This page displays error information about backplane number, module ID, error code and the date and time when the error occurred. You can use the Clear log button to clear the error record.



Item	Description
Refresh cycle	Refresh cycle time; default: 10; unit: second
“-“	Minus; click once to decrease 1; the minimum value is 1
“+“	Plus; click once to increase 1; the maximum value is 60
“Clear log”	Use this button to clear the error log in the PLC CPU
Rack No.	The ID of the rack in which an error occurs; read only
Slot No.	The ID of the slot in which an error occurs; read only
Module ID	The ID of the module in which an error occurs; read only
Error code	Error code; read only
Date & Time	The date and time when the error occurred; read only

11.4.7.3 Program Change Log Page

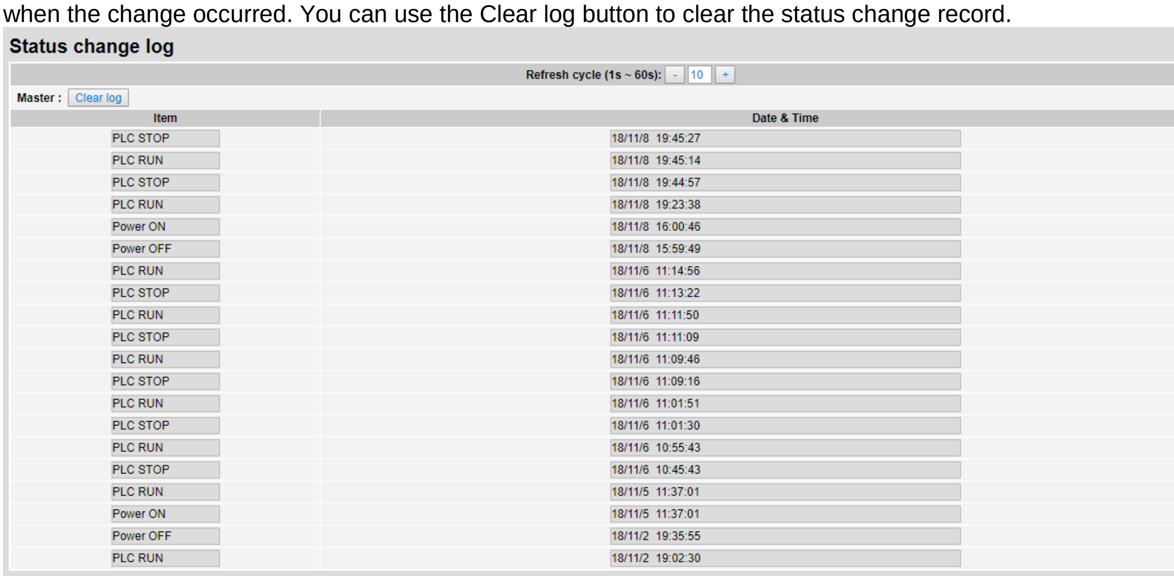
This page displays information on any changes on the program, including changed item, date and time when the change occurred. You can use the Clear log button to clear the program change record.



Item	Description
Refresh cycle	Refresh cycle time; default: 10; unit: second
"-"	Minus; click once to decrease 1; the minimum value is 1
"+"	Plus; click once to increase 1; the maximum value is 60
"Clear log"	Use this button to clear the program log in the PLC CPU
Item	The item that is changed in the program; read only
Date & Time	The date and time when the change occurred; read only

11.4.7.4 Status Change Log Page

This page displays information on any changes on the status, including status changed item, date and time when the change occurred. You can use the Clear log button to clear the status change record.


Status change log

Refresh cycle (1s ~ 60s): - 10 +

Master : Clear log

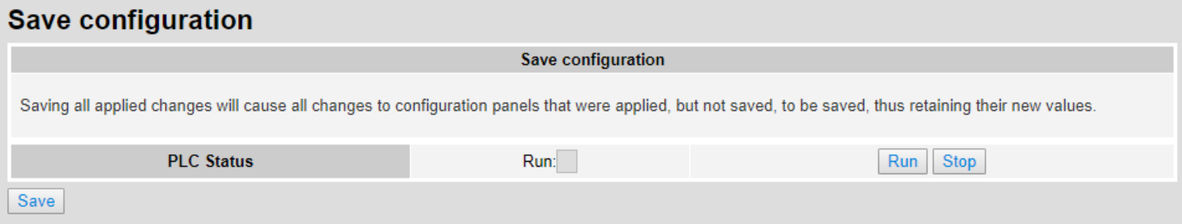
Item	Date & Time
PLC STOP	18/11/8 19:45:27
PLC RUN	18/11/8 19:45:14
PLC STOP	18/11/8 19:44:57
PLC RUN	18/11/8 19:23:38
Power ON	18/11/8 16:00:46
Power OFF	18/11/8 15:59:49
PLC RUN	18/11/6 11:14:56
PLC STOP	18/11/6 11:13:22
PLC RUN	18/11/6 11:11:50
PLC STOP	18/11/6 11:11:09
PLC RUN	18/11/6 11:09:46
PLC STOP	18/11/6 11:09:16
PLC RUN	18/11/6 11:01:51
PLC STOP	18/11/6 11:01:30
PLC RUN	18/11/6 10:55:43
PLC STOP	18/11/6 10:45:43
PLC RUN	18/11/5 11:37:01
Power ON	18/11/5 11:37:01
Power OFF	18/11/2 19:35:55
PLC RUN	18/11/2 19:02:30

Item	Description
Refresh cycle	Refresh cycle time; default: 10; unit: second
“-“	Minus; click once to decrease 1; the minimum value is 1
“+“	Plus; click once to increase 1; the maximum value is 60
“Clear log”	Use this button to clear the program log in the PLC CPU
Item	The item that is changed in the status; read only
Date & Time	The date and time when the change occurred; read only

11.4.8 Configurations

11.4.8.1 Save Configuration Page

You can save the configurations and download the parameters to your device here.



Item	Description
"Save"	Download the saved parameters to the device.
PLC Status	LED of PLC running status; read only Green light: RUN LED Not Lit: STOP
"Run" / "Stop"	Click "RUN" to set the running status to RUN Click "Stop" to set the running status to STOP

Note: The data monitor table must be downloaded to the device. If not, once you log out, close the page or restart the PLC, all the temporary saved parameters will be cleared.

11.5 EtherNet / IP

Please refer to EtherNet/IP user manual for more information.

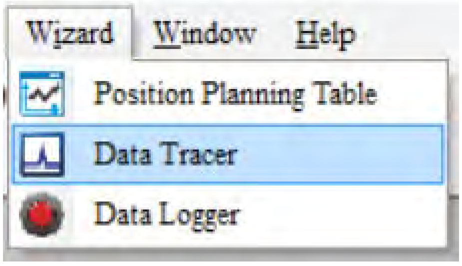
11.6 Data Tracer

11.6.1 About Data Tracer

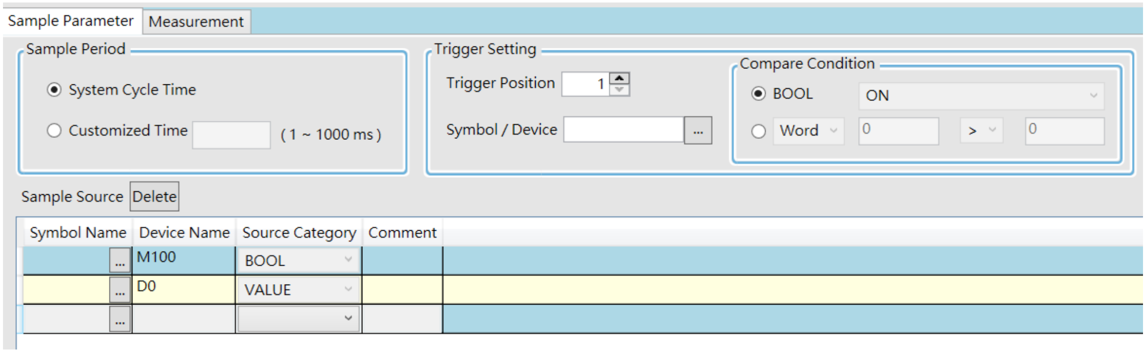
Data Tracer is used for the real-time collection of variable symbols, values, states in devices, after some trigger condition is met so as to draw curve charts for analysis of value trends. Refer to Section 23.2 in ISPSoft User Manual for more details.

Operation 1

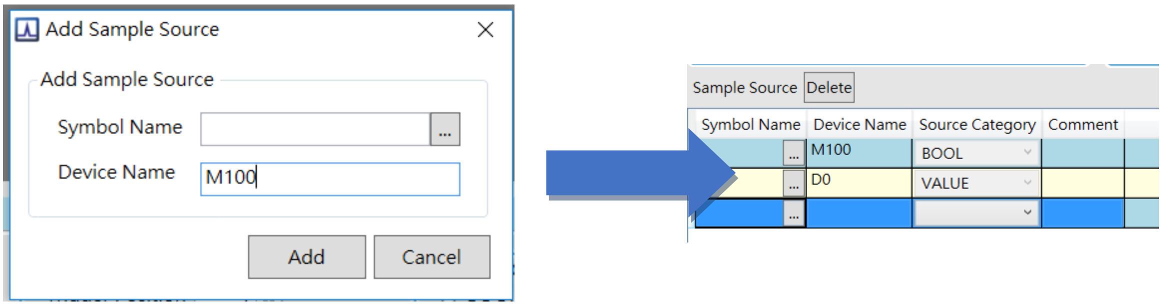
- Compile the current project before using the function. Click Wizard> Data Tracer to open the Data Tracer window as shown below.



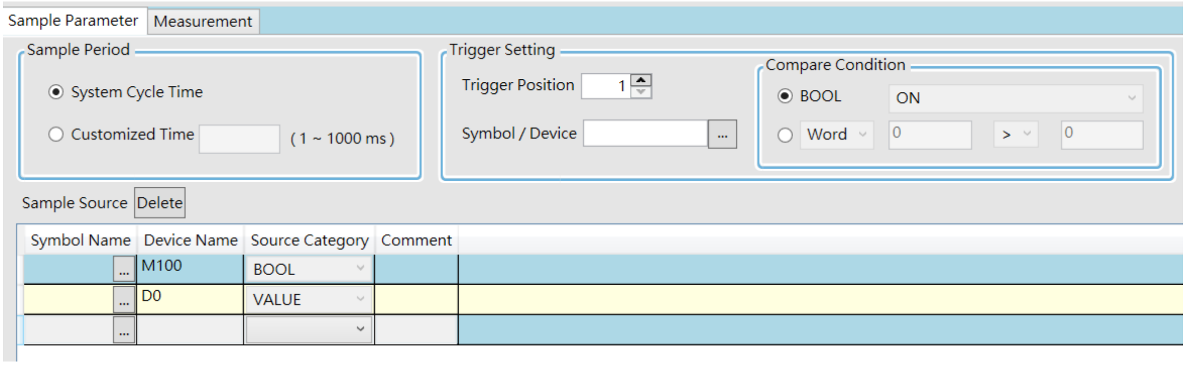
- Click the button of **Symbol Name** to open the **Add Sample Source** window.



- Click the button of **Symbol Name** in the **Add Sample Source** window and select the variable symbol name to be added in the **Choose Symbol** window or directly type a device name in the **Device Name** box.

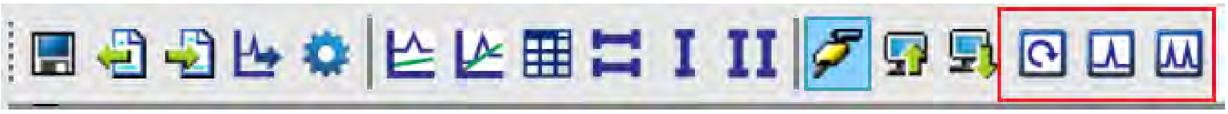


- Set up the sample period and trigger setting.

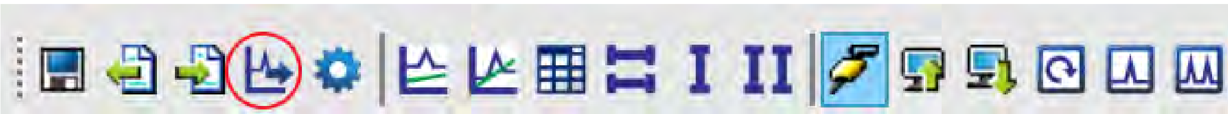


- After setting up the parameters, click  on the icon toolbar to have the system in the online mode. Then click  to download the settings to the PLC.

- After the sample parameter settings in the data tracer are completed and downloaded, any of the following three modes on the icon toolbar can be used for watching curves in the online mode.



- Click  on the icon toolbar to export the data to your computer for future use.



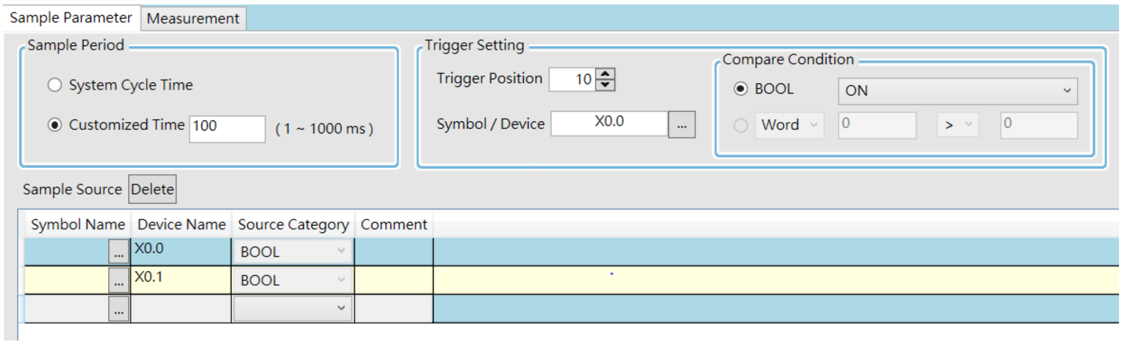
11.6.2 Example

If X0.0 is a signal to open/close externally. Use Data Trace to measure the width of time when X0.0 is ON.

- **Steps:**

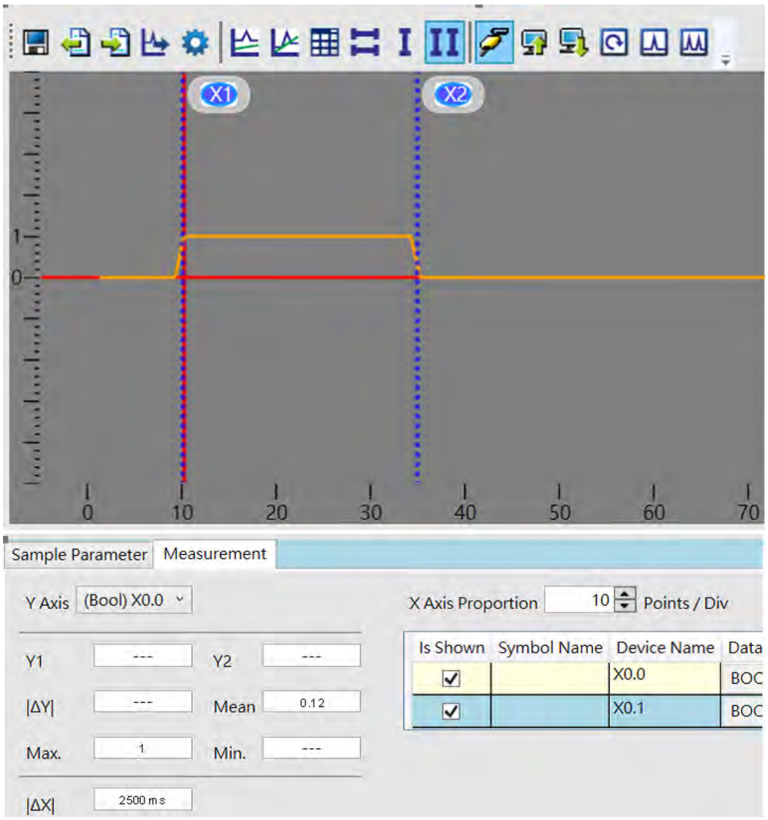
① Open Data Tracer and enter X0.0 for monitoring.

② Set the Customized Time to 100 ms to take samping, set the trigger device to X0.0, set the trigger position to 10, and then set the compare condition to ON as the image shown below.



③ Set the mode to One-shot trigger and wait for the trigger (ON). Once it is triggered, it displays the recorded curve data.

④ The value in **I Δ X1** is 2500 ms, the time measured between two vertical lines, X1 and X2. for X0.0.



11.6.3 Specification

Item	Maximum
Number of devices to be traced at the same time	20
Number of data to be traced for each device	200

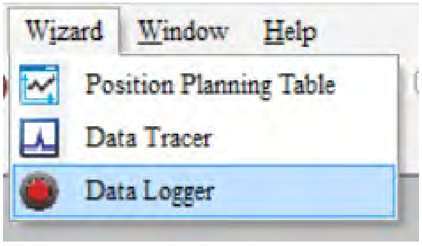
11.7 Data Logger

11.7.1 About Data Logger

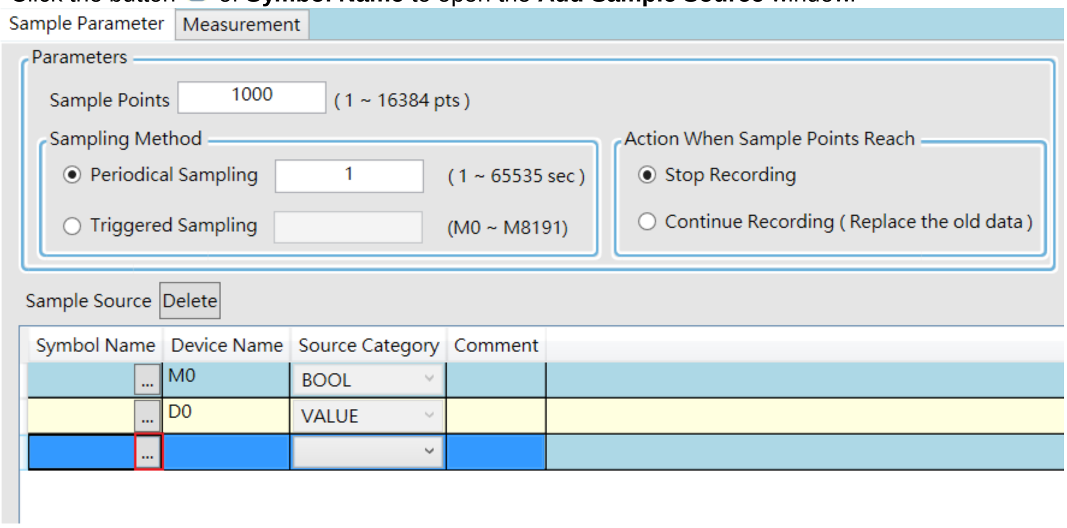
Data logger is used for the long-term recording of variable symbols, values, states in devices, and drawing curve charts. The data is stored in the PLC and the memory card of the PLC for analysis of value trends. Refer to Section 23.3 in ISPSoft User Manual for more details.

Operation A

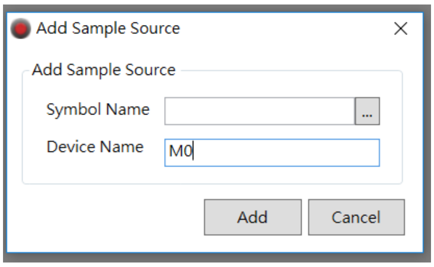
- Compile the current project before using the function. Click Wizard> Data Logger to open the Data Logger window as shown below.

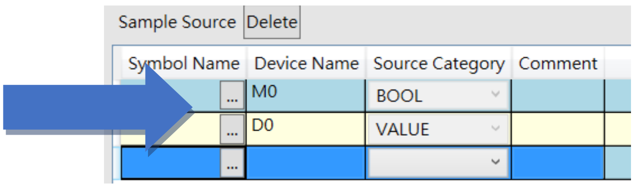


- Click the button of **Symbol Name** to open the **Add Sample Source** window.



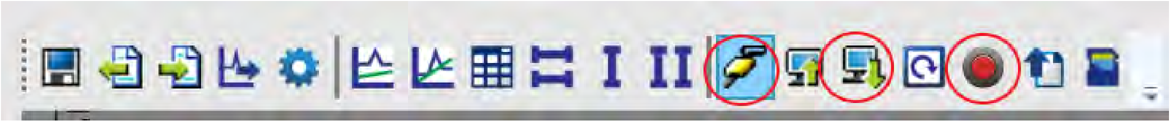
- Click the button of **Symbol Name** in the **Add Sample Source** window and select the variable symbol name to be added in the **Choose Symbol** window or directly type a device name in the **Device Name** box.





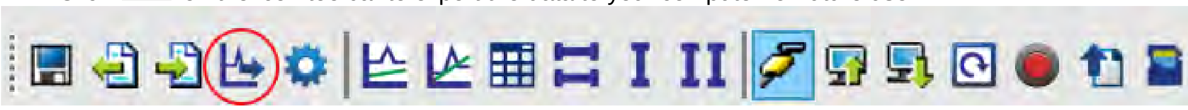
- After setting up the parameters, click  on the icon toolbar to have the system in the online mode. Then click  to download the settings to the PLC. And then click  to record data.

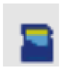
  Note: From here you can also follow Operation B to complete the recording and saving.



- When the recording is done, click the uploade button to update the data for later viewing.

- Click  on the icon toolbar to export the data to your computer for future use.

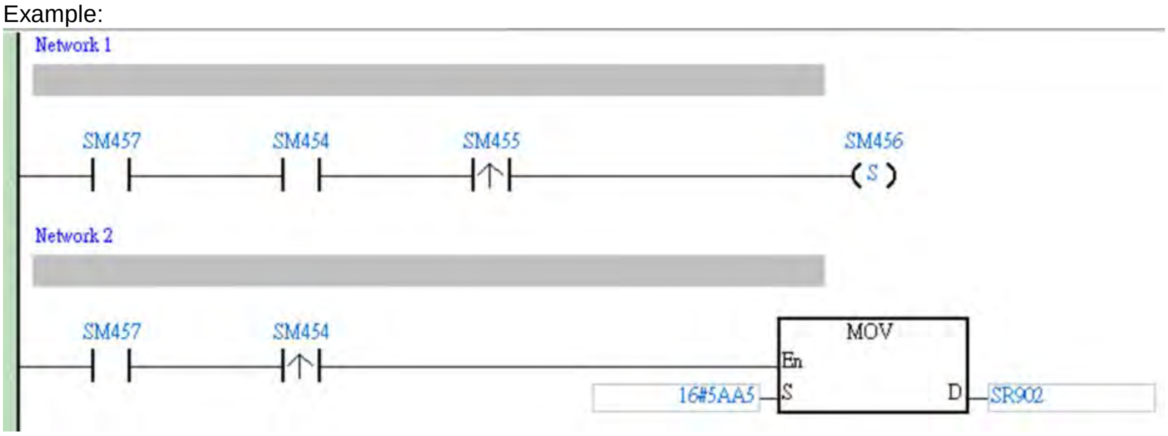


- Click  on the icon toolbar or use SM and SR to save the data to the SD Card installed on the PLC.

Operation B

You can also use SM flags or SR registors to complete the data recording, data saving or set to store data on a SD card permanently. See the example below for reference.

Example:



- Check if the flag SM457 is ON. If the flag SM457 is ON, it indicates the valid recorded parameters are downloaded in data logger. And that means the operation A is done correctly.

- Use inputs to enable/disable or set the flag SM454 to ON for the PLC to start recording. If you need to store data on a SD card, set SR902=16#5AA5.

- When SM455 is ON or when the quantity of data has met the value set in SR900 (32-bit value), the system start saving data on a SD card.
  NOTE: While sending data to the SD card for storage, the PLC needs a period of undisturbing time, approximately tens of milliseconds. During this period, the PLC is not allowed to execute interrupts. Make sure the PLC is NOT executing any interrupts, especially the external input ones before starting to send data to the SD card for storage.

- When SM455 is switching from OFF to ON, set SM456 ON. And the PLC starts to store the recorded data on the SD card. The default path and the file name are as shown below:

- Default saving path

  \SDCard\PLC CARD\AH500\Log

- Default file name
  DATA_LOGGER_yyyymmdd_hhmmss.log
  EX: DATA_LOGGER_20181108_161901.log

11.7.2 Related SM Flags and SR Registors

SM / SR	Attr.	Description
SM450	R	Check here to see if a SD Card is installed in the PLC. ON: SD card inside OFF: No SD card
SM452	R	Check here to see if data is being stored on the SD card. ON: In the operation of storing OFF: Not in the operation of storing
SM453	R	Check here to see if there is any SD card operational error. ON: Abnormal OFF: Normal
SR453	R	Check here to see the last operational error code of the SD card. Note: Only available when SM453=ON
SM454	R/W	Set this flag to ON/OFF to start or stop recording. The system will not set this flag to OFF automatically even if the space for recording is full. You need to set the flag to OFF manually.
SM455	R	Check here to see if the recorded number has reached the set limit. ON: The quantity of recordings has reached the set number or the SD card is in cycle recording.
SM456	R/W	Used with SR902 to activate the settings in SR902 for the SD card. Note: Set the flag from OFF to ON and the PLC starts to store the recorded data on the SD card when SR902=16#5AA5.
SM457	R	Check here to see if there is any valid, downloaded, recorded parameters in the data logger. ON: The valid recorded parameters are downloaded in data logger.
SR900	R	Check here to see the quantity of the recorded data (32-bit value). Note: It increments the number of the recorded data by 1 for each record.
SR902	R/W	Control codes for recorded data. ● 16#5AA5: Store data to a default root and specified file name on the SD card. ● 0: The storing is done. ● Others: Invalid numbers Note: Used with SM456 to activate this setting.

Note: “R” in the column of attribute (Attr.) indicates the item is read only and the status can be read here.

“W” in the column of attribute (Attr.) indicates you can set, delete or write a value for this item.

11.7.3 Specification

Item	Maximum
Number of devices to be logged at the same time	20
Total quantity of logged data (trigger mode)	10922
Total quantity of logged data (non-trigger mode)	32768
Number of data to be logged for each device	Less than or equal to the result of total quantiy of logged data devided by the number of devices

Chapter 12 Troubleshooting

Table of Contents

12.1 Troubleshooting

12.1.1 Basic Inspection

This chapter describes errors which occur when a system operates, reasons for these errors, and remedies. Before eliminating an error, users have to determine the reason for the error. Before determining the reason, the users have to check the following.

(1) The following items have to be checked.
- The PLC system must operate under the conditions which are regulated, e.g. the environment, the electrical condition, the mechanical vibration, and etc.
- The power is supplied to the power supply module properly, and the power supplied to the PLC system is normal.
- The backplanes, modules, terminals, and cables are installed properly.
- Every LED indicator is in a normal state.
- The setting of the switches is correct.

(2) Follow the instructions below, and check the operating state of the AH500 system.
- Turn the RUN/STOP switch.
- Check the condition for the running/stopping of the CPU module.
- Check and eliminate the influences that the external devices may cause.
- Monitor the operating state of the system and the error logs by means of ISPSoft.

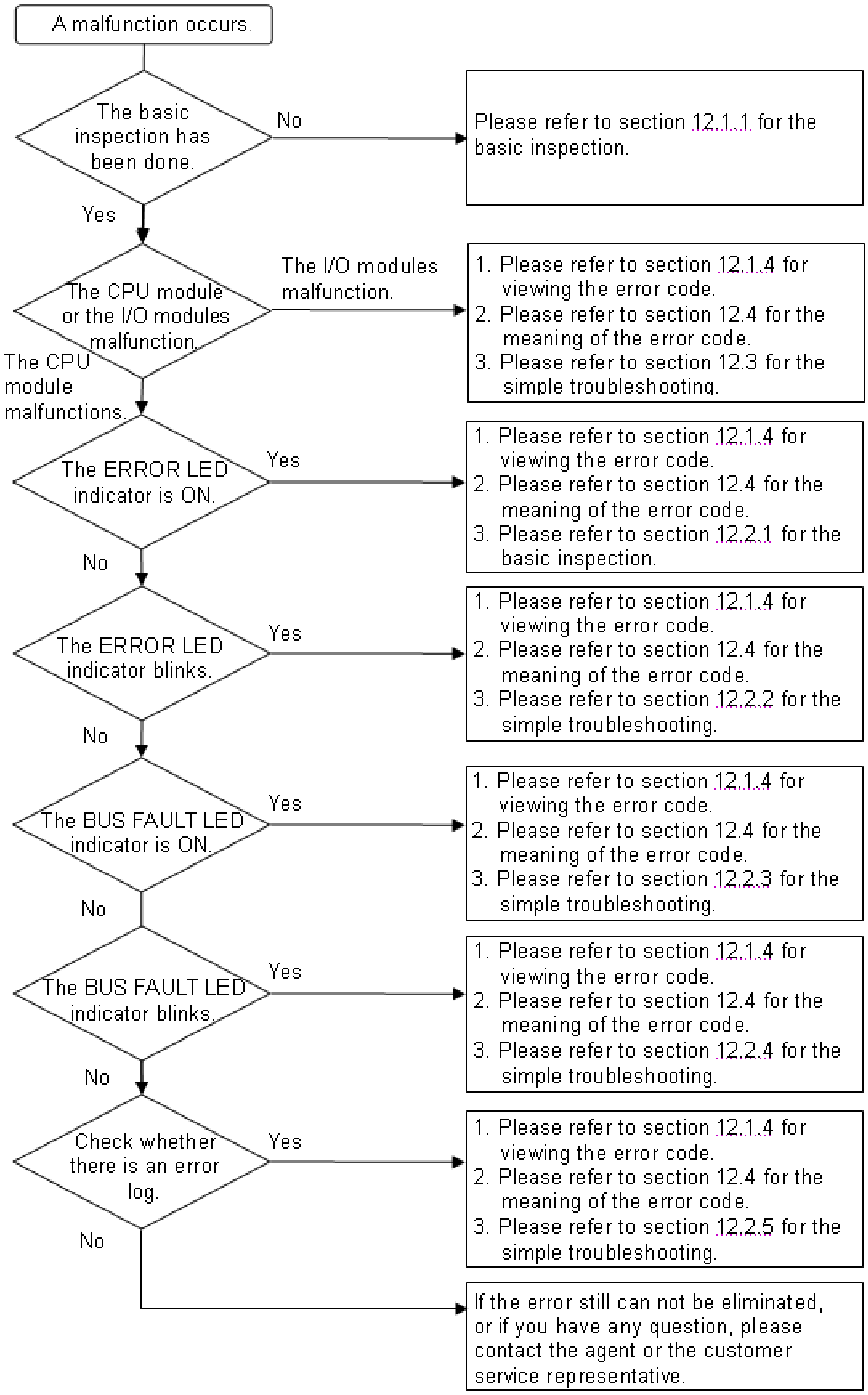
(3) Determine the reason for the error according to (1) and (2) above.
- The AH500 system or the external devices
- The CPU module or the extension modules
- The parameters or the control programs

12.1.2 Eliminating Errors

If an error occurs in a system, users can try to eliminate the error in the following ways. If the reason for the error still exists after the error is eliminate, the error will occur in the system again.

(1) Stop the CPU module, and then run it.
(2) Disconnect the CPU module, and then connect it.
(3) Clear the error log by means of ISPSoft.
(4) After the CPU module is rest, or restored to the factory setting, download the program again, and execute the program.

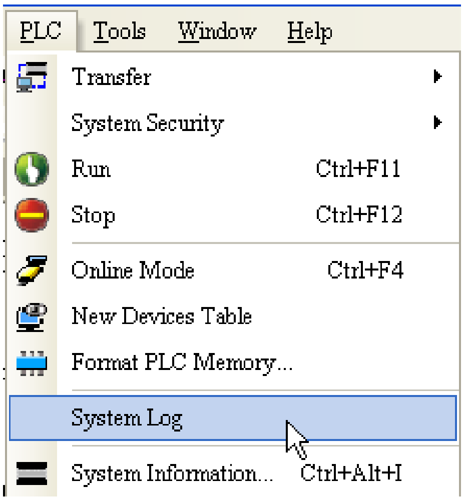
12.1.3 Troubleshooting Procedure



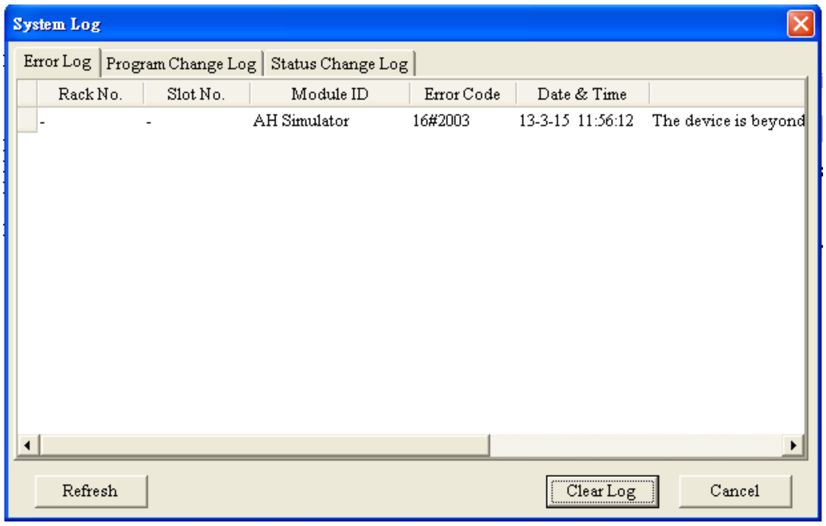
12.1.4 Viewing Error Logs

When an error occurs, a corresponding error code generated by a system is recorded in a CPU module. Twenty error logs at most can be stored in the CPU module. If there are more than twenty error logs generated, the oldest error log will be overwritten by the latest error log. However, if a memory card is installed in the CPU module, the twenty error logs are automatically backed up in the memory card before the oldest error log is overwritten. One thousand error logs at most can be stored in the memory card. If there are more than 1000 error logs which will be stored in the memory card, the twenty oldest error logs will be overwritten by the twenty latest error logs.

(1) After ISPSoft is started, click **System Log** on the **PLC** menu.



(2) The **System Log** window is as follows. Users can refresh the error logs by clicking **Refresh**, and clear the error logs in the window and the CPU module by clicking **Clear**.



- Rack number & Slot number: If errors are generated by extension modules, the racks and the slots on which the extension modules are installed are recorded in these columns. If no rack number and no slot number are recorded, it means that an error occurs in a CPU module.
- Module ID: The IDs of CPU modules, or those of extension modules
- Error Code: The error codes for error logs
- Date & Time: The time when errors occur
  The newer error log is exhibited in the upper row.
- The description related to an error log is in the last field.

12.2 Troubleshooting for CPU Modules

Users can get the remedies from the tables below according to the statuses of the LED indicators and the error codes.

12.2.1 ERROR LED Indicator's Being ON

Error code	Description	Remedy
16#000B	The program in the PLC is damaged.	Download the program again.
16#000D	The CPU parameters are damaged.	Reset the CPU parameter, and download it.
16#0010	The access to the memory in the CPU is denied.	Download the program or parameters again. If the problem still occurs, please contact the local authorized distributors.
16#0011	The PLC ID is incorrect. (SM9)	Please check the PLC ID.
16#0012	The PLC password is incorrect. (SM9)	Please check the PLC password.
16#0014	The procedure of restoring the system can not be executed. (SM9)	The contents of the system backup file are incorrect, or the file does not exist in the path specified. If the file exists and the procedure of restoring the system can not be executed, please backing up the system again. If the error still occurs, please contact the local authorized distributors. (Please refer to section 7.5 in AH500 Operation Manual, and section 21 in ISPSoft User Manual for more information about the memory card.)
16#0015	The module table is incorrect. (SM10)	The module table stored in the CPU module is incorrect. Compare the module table in HWCONFIG with the actual module configuration, and download the module table again.
16#0016	The module setting is incorrect. (SM10)	The module setting stored in the CPU module is incorrect. Check whether the version of the module inserted in the slot is the same as the version of the module in HWCONFIG. After the version of the module is updated, users can download the module setting again.
16#0017	The data register exceeds the device range. (SM10)	The data register stored in the CPU module exceeds the device range. Check whether the module parameter in HWCONFIG is correct, and download the module parameter again.
16#001B	Timed interrupt 0 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001C	Timed interrupt 1 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001D	Timed interrupt 2 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001E	Timed interrupt 3 is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#001F	The watchdog timer is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0020	The setting of the fixed scan time is incorrect.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0021	The setting of the fixed scan time is incorrect.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0022	The CPU parameter downloaded to the PLC is incorrect.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.

Error code	Description	Remedy
16#0023	The PLC parameter: the state of Y device (STOP->RUN) is set incorrectly.	Set the CPU parameter in HWCONFIG again, and download the CPU parameter again.
16#0025	The initial value of the symbol is not consistant with what is set in the program.	Download the symbol table again.
16#0026	Communication Ratio is set incorrectly.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0027	M device in the Latched Device Range is set incorrectly.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0028	D device in the Latched Device Range is set incorrectly.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0029	T device in the Latched Device Range is set incorrectly.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#002A	C device in the Latched Device Range is set incorrectly.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#002B	HC device in the Latched Device Range is set incorrectly.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0050	The memories in the latched special auxiliary relays are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0051	The latched special data registers are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0052	The memories in the latched auxiliary relays are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0053	The latched timers are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0054	The latched counters are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0055	The latched 32-bit counters are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0056	The memories in the latched timers are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0057	The memories in the latched counters are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0058	The memories in the latched 32-bit counters are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#0059	The latched data registers are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.

Error code	Description	Remedy
16#005A	The latched working registers are abnormal.	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#005B	Abnormal SFC parameters	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.
16#6010	BOOTP IP is set incorrectly. (SM1107)	Modify the BOOTP setting or check the settings in DHCP Server
16#6011	BOOTP Gateway is set incorrectly. (SM1107)	Modify the BOOTP setting or check the settings in DHCP Server
16#6013	DNS address is set incorrectly. (SM1107)	Modify the DNS setting and download the new DNS setting again.

12.2.2 ERROR LED Indicator's Blinking

Error code	Description	Remedy
16#000A	Scan timeout (SM8: The watchdog timer error)	1. Check the setting of the watchdog timer in HWCONFIG. 2. Check whether the program causes the long scan time
16#000C	The program downloaded to the PLC is incorrect.	After users compile the program again, they can download the program again.
16#000E	The program or the parameter is being downloaded, and therefore the PLC can not run.	After the program or the parameter is downloaded to the PLC, users can try to run the PLC.
16#0018	The serial port is abnormal. (SM9)	Retry the connection. If the error still occurs, please contact the local authorized distributors.
16#0019	The USB is abnormal. (SM9)	Retry the connection. If the error still occurs, please contact the local authorized distributors.
16#001A	Incorrect system backup file (DUP)	Generate a new system backup file fore restoration.
16#0033	The communication setting of COM1 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0034	The setting of the station address of COM1 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0035	The setting of the communication type of COM1 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0038	The communication setting of COM2 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0039	The setting of the station address of COM2 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#003A	The setting of the communication type of COM2 is incorrect. (SM9)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#0066	An error occurs when the system is backed up.	1. Check whether the memory card is normal, and whether the capacity of the memory card is large enough. 2. Retry the backup procedure. If the error still occurs, please contact the local authorized distributors.
16#0067	The length of the restored system parameters exceeds the length of the CPU module system parameters.	This error code is a warning code.
16#0068	Corrupted symbol table	Download the symbol table again.
16#0069	Corrutped EIP parameters	After users reset the CPU module or restore it to the factory setting, they can download the program and the parameter again.

Error code	Description	Remedy
16#2000	There is no END in the program in the PLC. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#2001	Syntax error (SM5)	Check the program, compile the program again, and download the program again.
16#2002	GOEND is used incorrectly. (SM5)	Check the program, compile the program again, and download the program again.
16#2003	The devices used in the program exceed the range. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2004	The part of the program specified by the label used in CJ/JMP is incorrect, or the label is used repeatedly. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2005	The N value used in MC is not the same as the corresponding N value used in MCR, or the number of N values used in MC is not the same as the number of N values used in MCR. (SM5)	Check the program, compile the program again, and download the program again.
16#2006	The N values used in MC do not start from 0, or the N values used in MC are not continuous. (SM5)	Check the program, compile the program again, and download the program again.
16#2007	The operands used in ZRST are not used properly. (SM5)	Check the program, compile the program again, and download the program again.
16#200A	Invalid instruction (SM5)	Check the program, compile the program again, and download the program again.
16#200B	The operand **n** or the other constant operands exceed the range. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200C	The operands overlap. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200D	An error occurs when the binary number is converted into the binary-coded decimal number. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200E	The string does not end with 0x00. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#200F	The instruction does not support the modification by an index register. (SM5)	Check the program, compile the program again, and download the program again.
16#2010	1. The instruction does not support the device. 2. Encoding error 3. The instruction is a 16-bit instruction, but the constant operand is a 32-bit code. (SM5)	Check the program, compile the program again, and download the program again.
16#2011	The number of operands is incorrect. (SM5)	Check the program, compile the program again, and download the program again.
16#2012	Incorrect division operation (SM0/SM5).	Check the program, compile the program again, and download the program again.

Error code	Description	Remedy
16#2013	The value exceeds the range of values which can be represented by the floating-point numbers. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2014	The task designated by TKON/TKOFF is incorrect, or exceeds the range. (SM5)	Check the program, compile the program again, and download the program again.
16#2015	There are more than 32 levels of nested program structures supported by CALL. (SM0)	Check the program, compile the program again, and download the program again.
16#2016	There are more than 32 levels of nested program structures supported by FOR/NEXT. (SM0/SM5)	Check the program, compile the program again, and download the program again.
16#2017	The number of times FOR is used is different from the number of times NEXT is used. (SM5)	Check the program, compile the program again, and download the program again.
16#2018	There is a label after FEND, but there is no SRET. There is SRET, but there is no label. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#2019	The interrupt task is not after FEND. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#201A	IRET/SRET is not after FEND. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#201B	There is an interrupt task, but there is no IRET. There is IRET, but there is not interrupt task. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#201C	End is not at the end of the program. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#201D	There is CALL, but there is no MAR. (SM5)	1. Compile the program again, and download the program again. 2. Reinstall ISPSoft, compile the program again, and download the program again.
16#201E	The function code used in MODRW is incorrect. (SM102/SM103)	Check the usage of the instruction and the setting of the operands. Please refer to the explanation of the instruction MODRW in AH500 Programming Manual for more information.
16#201F	The length of the data set in MODRW is incorrect. (SM102/SM103)	Check the usage of the instruction and the setting of the operands. Please refer to the explanation of the instruction MODRW in AH500 Programming Manual for more information.
16#2020	The communication command received by using MODRW is incorrect. (SM102/SM103)	Check whether the slave supports the function code and the specified operation.

Error code	Description	Remedy
16#2021	The checksum of the command received is incorrect. (SM102/SM103)	1. Check whether there is noise, and retry the sending of the command. 2. Check whether the slave operates normally.
16#2022	The format of the command used in MODRW does not conform to the ASCII format. (SM102/SM103)	Make sure that the format of the command conforms to the ASCII format.
16#2023	There is a communication timeout when MODRW is executed. (SM120/SM103)	Check whether the slave operates normally, and whether the connection is normal.
16#2024	The setting value of the communication timeout is invalid. (SM120/SM103)	1. Check the program and the related special data registers. 2. Set the communication port parameter for the CPU module in HWCONFIG again.
16#2025	There is a communication timeout when RS is executed. (SM120/SM103)	Check whether the slave operates normally, and whether the connection is normal.
16#2026	The RS communication interrupt is abnormal. (SM102/104)	Check whether the interrupt service routine used with RS is downloaded.
16#2027	The execution of FWD is abnormal. (SM102/103)	Refer to AH500 Programming Manual, and check the instruction FWD.
16#2028	The execution of REV is abnormal. (SM102/103)	Refer to AH500 Programming Manual, and check the instruction REV.
16#2029	The execution of STOP is abnormal. (SM102/103)	Refer to AH500 Programming Manual, and check the instruction STOP.
16#202A	The execution of RSDT is abnormal. (SM102/103)	Refer to AH500 Programming Manual, and check the instruction RSDT.
16#202B	The execution of RSTEF is abnormal. (SM102/103)	Refer to AH500 Programming Manual, and check the instruction RSTEF.
16#202C | 16#204B	I/O interrupt service routine 0-31 does not exist.	Download I/O interrupt service routine 0-31 (I/O interrupt 0-31).
16#2054 | 16#2127	I/O interrupt service routine 40-251 does not exist.	Download I/O interrupt service routine 40-251 (I/O interrupt 40-251).
16#2128	An action in a sequential function chart is incorrectly assigned qualifiers related to time. (SM0/SM1)	Check whether the action in the sequential function chart is assigned qualifiers related to time.
16#2129	The modifier R is assigned to an action in a sequential function chart incorrectly. (SM0/SM1)	Check whether the reset modifier assigned to the action in the sequential function chart conflicts with another modifier assigned to the action in the sequential function chart.
16#212A	MC/MCR instruction cannot be used in interrupt or subroutine. (SM5)	Check the program, compile the program again, and download the program again.
16#6000	Ethernet speed cannot be detected (SM1106)	Check the Ethernet cable securely connected and is functioning normally.
16#6001	Illegal IP address (SM1107)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.

Error code	Description	Remedy
16#6002	Illegal netmask address (SM1107)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6003	Illegal gateway mask (SM1107)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6004	The IP address filter is set incorrectly. (SM1108)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6006	The static ARP table is set incorrectly. (SM1108)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6007	The NTP client service is set incorrectly. (SM1380)	Check the setting of the NTP client service, and download it again.
16#6008	Illegal network number (SM1107)	Check the network configuration in NWCONFIG, and download it again.
16#6009	Illegal node number (SM1107)	Check the network configuration in NWCONFIG, and download it again.
16#600F	The maximum MODBUS TCP connection is reached. (SM1089)	Check the number of MODBUS TCP connections to see if the number of the current total connections exceeds the maximum number of MODBUS TCP connections.
16#6012	Duplicated IP address (SM1107)	Modify the IP address and download it again.
16#6101	The trigger in the email is set incorrectly. (SM1112)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6102	The interval of sending the email is set incorrectly. (SM1112)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6103	The device containing the data specified as the attachment exceeds the device range. (SM1112)	Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6106	The SMTP server address is incorrect. (SM1112)	Make sure that the address is correct, and set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6108	SMTP authentication error (SM1112)	Check the user name, and the password. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6110	The SMTP server needs to be authenticated. (SM1112)	Check the user name, and the password. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6111	The specified email address does not exist. (SM1112)	1. Check whether the email address is correct. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6200	The remote IP address set in the TCP socket function is illegal. (SM1196)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6209	The remote IP address set in the UDP socket function is illegal. (SM1196)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6300	Only auxiliary relays, data registers, and link registers can be used in the Ether Link.	Check the setting of the Ether Link in NWCONFIG, and download it again.

Error code	Description	Remedy
16#6301	The device used in the Ether Link exceeds the device range.	Check whether the device used in the Ether Link is within the device range supported by the CPU module.
16#6302	The length of the data exchanged in the Ether Link exceeds the limit.	Check whether the length of the data exchanged in the Ether Link is within the range supported by the CPU module.
16#6305	The node used in the communication command is different from the local node.	Check the setting of the Ether Link in NWCONFIG, and download it again.
16#630A	The module ID or the setting of the module is different from the setting in the Ether Link.	1. Check the setting of the parameter in HWCONFIG. 2. Check the setting of the Ether Link in NWCONFIG.
16#630B	The setting of the netmask address for the CPU or the module is different from the setting in the Ether Link.	1. Check the setting of the parameter in HWCONFIG. 2. Check the setting of the Ether Link in NWCONFIG.
16#6500	An error occurs when a data exchange function is initialized. (SM699)	Check whether the sum of the number of Modbus TCP data exchange blocks and the number of the Ether link data exchange blocks exceeds the system specifications, and download the setting again.
16#860F	An error occurs during the process of system restore	Some error in the backup file or the backup file does not exist in the appointed file path. Recreate the backup file and run the system restore again. If this error persists, contact the local authorized distributors.

12.2.3 BUS FAULT LED Indicator's Being ON

When a CPU module detects an error, the BUS FAULT LED indicator on the CPU module is ON. The BUS FAULT LED indicator on the CPU module corresponds to the ERROR LED indicator on an I/O module. If an error occurs in an I/O module, the status of the BUS FAULT LED indicator on the CPU module is the same as that of the ERROR LED indicator on the I/O module. If there are errors occurring in the I/O modules, the BUS FAULT LED indicator on the CPU module will be ON. For example, the BUS FAULT LED indicator on the CPU module will be ON if the ERROR LED indicator on I/O module A is ON and the ERROR LED indicator on I/O module B blinks. If the ERROR LED indicator on I/O module B still blinks after the error occurring in I/O module A is eliminated, the BUS FAULT LED indicator on the CPU module will blink. Please refer to sections 12.4 in this manual for more information about the LED indicators.

Users can get the remedies for the errors detected by a CPU module from the table below. If the error code which users get is not listed in the table below, users need to check whether the I/O module operates normally. Please refer to section 12.3 in this manual for more information about the troubleshooting for I/O modules.

Error code	Description	Remedy
16#0013	The I/O module can not run/stop. (SM10)	Check whether the setting of the parameter for the module is correct. If the setting is correct, please check whether the module breaks down. If the error still occurs, please contact the local authorized distributors.
16#0014	The procedure of restoring the system can not be executed. (SM9)	The contents of the system backup file are incorrect, or the file does not exist in the path specified. If the file exists and the procedure of restoring the system can not be executed, please backing up the system again. If the error still occurs, please contact the local authorized distributors. (Please refer to section 7.5 in AH500 Operation Manual, and section 18.2 in ISPSoft User Manual for more information about the memory card.)
16#1400	An error occurs when the data is accessed through the auxiliary processor. (SM9)	Check and eliminate the problem. If the problem persists, contact the local authorized distributors.
16#1401	An error occurs when the data in the I/O module is accessed. (SM9)	Check and eliminate the problem. If the problem persists, contact the local authorized distributors.
16#1402	The actual arrangement of the I/O modules is not consistent with the module table. (SM9)	Check whether the module table in HWCONFIG is consistent with the actual arrangement of the I/O modules.
16#1403	An error occurs when the data is read from the module. (SM9)	Check whether the module operates normally. If the error still occurs, please contact the local authorized distributors.
16#1405	The setting parameter of the module is not found. (SM9)	Set the parameter in HWCONFIG again, and download it.
16#1407	A communication error occurs when the data is accessed through the auxiliary processor. (SM9)	Check and eliminate the problem. If the problem persists, contact the local authorized distributors.
16#1409	The extension backplane is disconnected. (SM9)	1. Check whether the extension backplane is connected properly and make sure the settings on the HWCOFIG is the same as the actual placement. 2. Check whether the extension backplane operates normally, and make sure that the extension backplane is not affected by noise.

Error code	Description	Remedy
16#140A	The communication with the extension backplane is incorrect. (SM9)	1. Check whether the extension backplane is connected properly. 2. Check whether the extension backplane operates normally, and make sure that the extension backplane is not affected by noise.
16#140B	The number of network modules exceeds the limit. (SM9)	Please decrease the number of network modules to the number supported by the system.
16#140C	The checksum of the high-speed data exchange is incorrect.	Check the module firmware version and contact the local authorized distributors.
16#140D	The ID of the actual power supply module is not the same as the ID of the power supply module set in HWCONFIG. (SM9)	Check whether the ID of the power supply module set in HWCONFIG is the same as the ID of the actual power supply module.
16#140E	The amount of data exchanged at a high speed exceeds the maximum amount supported. (SM10)	Check the module firmware version and contact the local authorized distributors.
16#140F	High-speed data exchange error (SM11)	Check the module firmware version and contact the local authorized distributors.
16#1410	RTU IO module sending out error	Check the installation and power of the RTU IO modules.
16#1411	RTU IO module sending out warnings	Check if the RTU IO modules function normally.
16#1421	Error occurs when a CPU module reads settings from the Intelligent module configuration	Check the module firmware version and contact the local authorized distributors.
16#1422	Error occurs when a CPU module writes settings in the Intelligent module configuration	Check the module firmware version and contact the local authorized distributors.

12.2.4 BUS FAULT LED Indicator's Blinking

If the BUS FAULT LED blinks, please check the operating state of the module. Please refer to sections 12.4 in this manual for more information about the LED indicators, and section 12.3 in this manual for more information about the troubleshooting for I/O modules.

12.2.5 Troubleshooting for AH500 Redundancy System

Error Code	Description	Solution
16#E206	The model number for the control mode CPU and the standby mode CPU are not the same.	Use two same models and assign one as the control mode CPU and the other as the standby mode CPU.
16#E207	The firmware version for the control mode CPU and the standby mode CPU are not the same.	Use two same models and assign one as the control mode CPU and the other as the standby mode CPU.
16#E208	Ethernet for the control mode CPU and the standby mode CPU are not in the same physical network.	The IP address and mask for the control mode CPU and the standby mode CPU must be on the same physical network.
16#E209	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (while checking the validation)	Make sure the IO configurations on the backplane for the control mode CPU and the standby mode CPU are the same. Both the control mode CPU and the standby mode CPU must be connected to the backplane. And make sure the firmware versions for the control mode CPU and the standby mode CPU are the same.
16#E20A	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (after the validation is checked)	Make sure the IO configurations on the backplane for the control mode CPU and the standby mode CPU are the same. Both the control mode CPU and the standby mode CPU must be connected to the backplane. And make sure the firmware versions for the control mode CPU and the standby mode CPU are the same.
16#E20B	System error	Check the error log for more information
16#E20C	Synchronization error	While downloading, the system can not synchronize. Try again later.
16#E20D	Validation failed	Check the standby mode CPU error log
16#E20E	I/O bus fault	Clear the I/O bus error
16#E20F	Heart beat error	Check the standby mode CPU error log
16#E210	Heart beat communication timeout	Make sure the fiber module is well-connected.
16#E211	Synchronization failed	Power off and then power on the standby mode CPU and start synchronization again. If the error still occurs, contact the local authorized distributors.
16#E212	The standby mode CPU is being switched.	Try again later.
16#E213	There is no program on the PLC.	Check the error log for more information
16#E214	PLC program is damage.	Check the error log for more information
16#E215	Scan time out	Check the error log for more information
16#E216	CPU access denied	Check the error log for more information
16#E217	System busy (RST)	Try again later.
16#E218	System busy (CLR)	Try again later.
16#E219	Turning on the system	Wait
16#E21A	Initialization error	Resupply power and turn it on again.
16#E21B	CPU parameters are damage.	Check the error log for more information
16#E21C	Non-latched area error	Check the error log for more information
16#E21D	CPU EIP parameters are damage.	Check the error log for more information
16#E21E	The I/O configuration file does not exist.	Download a correct I/O parameter file via HWCONFIG again.
16#E21F	The I/O configuration file is damage.	Download a correct I/O parameter file via HWCONFIG again.
16#E221	PLC program error	Check the error log for more information

Error Code	Description	Solution
16#E230	Ethernet connection error in a redundancy system	Check the Ethernet connection on the control mode CPU and standby mode CPU
16#E260	Module on the main backplane slot 0 does not support a redundancy system.	Update module firmware.
16#E261	Module on the main backplane slot 1 does not support a redundancy system.	Update module firmware.
16#E262	Module on the main backplane slot 2 does not support a redundancy system.	Update module firmware.
16#E263	Module on the main backplane slot 3 does not support a redundancy system.	Update module firmware.
16#E264	Module on the main backplane slot 4 does not support a redundancy system.	Update module firmware.
16#E265	Module on the main backplane slot 5 does not support a redundancy system.	Update module firmware.
16#E266	Module on the main backplane slot 6 does not support a redundancy system.	Update module firmware.
16#E267	Module on the main backplane slot 7 does not support a redundancy system.	Update module firmware.
16#E268	Module on the main backplane slot 8 does not support a redundancy system.	Update module firmware.
16#E269	Module on the main backplane slot 9 does not support a redundancy system.	Update module firmware.
16#E26A	Module on the main backplane slot 10 does not support a redundancy system.	Update module firmware.
16#E26B	Module on the main backplane slot 11 does not support a redundancy system.	Update module firmware.
16#E270	Network module on the main backplane slot 0 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 0.
16#E271	Network module on the main backplane slot 1 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 1.
16#E272	Network module on the main backplane slot 2 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 2.
16#E273	Network module on the main backplane slot 3 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 3.
16#E274	Network module on the main backplane slot 4 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 4.
16#E275	Network module on the main backplane slot 5 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 5.
16#E276	Network module on the main backplane slot 6 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 6.
16#E277	Network module on the main backplane slot 7 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 7.
16#E278	Network module on the main backplane slot 8 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 8.
16#E279	Network module on the main backplane slot 9 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 9.
16#E27A	Network module on the main backplane slot 10 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 10.
16#E27B	Network module on the main backplane slot 11 does not connect to a network cable.	Make sure the network cable is connected to the network module on the main backplance slot 11.

Error Code	Description	Solution
16#E280	The network module IP of the control mode CPU on the main backplane slot 0 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 0 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 0 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 0 are on the same physical network.
16#E281	The network module IP of the control mode CPU on the main backplane slot 1 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 1 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 1 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 1 are on the same physical network.
16#E282	The network module IP of the control mode CPU on the main backplane slot 2 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 2 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 2 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 2 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 2 are on the same physical network.

Error Code	Description	Solution
16#E283	The network module IP of the control mode CPU on the main backplane slot 3 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 3 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 3 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 3 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 3 are on the same physical network.
16#E284	The network module IP of the control mode CPU on the main backplane slot 4 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 4 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 4 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 4 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 4 are on the same physical network.
16#E285	The network module IP of the control mode CPU on the main backplane slot 5 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 5 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 5 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 5 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 5 are on the same physical network.

Error Code	Description	Solution
16#E286	The network module IP of the control mode CPU on the main backplane slot 6 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 6 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 6 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 6 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 6 are on the same physical network.
16#E287	The network module IP of the control mode CPU on the main backplane slot 7 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 7 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 7 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 7 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 7 are on the same physical network.
16#E288	The network module IP of the control mode CPU on the main backplane slot 8 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 8 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 8 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 8 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 8 are on the same physical network.

Error Code	Description	Solution
16#E289	The network module IP of the control mode CPU on the main backplane slot 9 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 9 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 9 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 9 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 9 are on the same physical network.
16#E28A	The network module IP of the control mode CPU on the main backplane slot 10 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 10 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 10 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 10 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 10 are on the same physical network.
16#E28B	The network module IP of the control mode CPU on the main backplane slot 11 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 11 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 11 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 11 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 11 are on the same physical network.

Error Code	Description	Solution
16#E290	The network module heart beat of the control mode CPU on the main backplane slot 0 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 0 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module’s network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module’s network cable of the standby mode CPU on the main backplane slot 0 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 0 are on the same physical network.
16#E291	The network module heart beat of the control mode CPU on the main backplane slot 1 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 1 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module’s network cable of the control mode CPU on the main backplane slot 0 is connected to the network port 1, the network module’s network cable of the standby mode CPU on the main backplane slot 1 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 1 are on the same physical network.
16#E292	The network module heart beat of the control mode CPU on the main backplane slot 2 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 2 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module’s network cable of the control mode CPU on the main backplane slot 2 is connected to the network port 1, the network module’s network cable of the standby mode CPU on the main backplane slot 2 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 2 are on the same physical network.

Error Code	Description	Solution
16#E293	The network module heart beat of the control mode CPU on the main backplane slot 3 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 3 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 3 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 3 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 3 are on the same physical network.
16#E294	The network module heart beat of the control mode CPU on the main backplane slot 4 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 4 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 4 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 4 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 4 are on the same physical network.
16#E295	The network module heart beat of the control mode CPU on the main backplane slot 5 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 5 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 5 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 5 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 5 are on the same physical network.

Error Code	Description	Solution
16#E296	The network module heart beat of the control mode CPU on the main backplane slot 6 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 6 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module’s network cable of the control mode CPU on the main backplane slot 6 is connected to the network port 1, the network module’s network cable of the standby mode CPU on the main backplane slot 6 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 6 are on the same physical network.
16#E297	The network module heart beat of the control mode CPU on the main backplane slot 7 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 7 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module’s network cable of the control mode CPU on the main backplane slot 7 is connected to the network port 1, the network module’s network cable of the standby mode CPU on the main backplane slot 7 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 7 are on the same physical network.
16#E298	The network module heart beat of the control mode CPU on the main backplane slot 8 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 8 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module’s network cable of the control mode CPU on the main backplane slot 8 is connected to the network port 1, the network module’s network cable of the standby mode CPU on the main backplane slot 8 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 8 are on the same physical network.

Error Code	Description	Solution
16#E299	The network module heart beat of the control mode CPU on the main backplane slot 9 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 9 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 9 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 9 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 9 are on the same physical network.
16#E29A	The network module heart beat of the control mode CPU on the main backplane slot 10 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 10 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 10 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 10 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 10 are on the same physical network.
16#E29B	The network module heart beat of the control mode CPU on the main backplane slot 11 cannot be detected.	1. Make sure the network cables of the network modules on the main backplane slot 11 are well-connected both on the control mode CPU and standby mode CPU. 2. If the network module's network cable of the control mode CPU on the main backplane slot 11 is connected to the network port 1, the network module's network cable of the standby mode CPU on the main backplane slot 11 must be connected to the network port 1 as well. 3. Mare sure the network modules of the control mode CPU and the standby mode CPU on the main backplane slot 11 are on the same physical network.
16#E2A0	The IP detection on the network module installed on the main backplane slot 0 has NOT been executed.	After the execution of IP detection is complete.
16#E2A1	The IP detection on the network module installed on the main backplane slot 1 has NOT been executed.	After the execution of IP detection is complete.
16#E2A2	The IP detection on the network module installed on the main backplane slot 2 has NOT been executed.	After the execution of IP detection is complete.
16#E2A3	The IP detection on the network module installed on the main backplane slot 3 has NOT been executed.	After the execution of IP detection is complete.

Error Code	Description	Solution
16#E2A4	The IP detection on the network module installed on the main backplane slot 4 has NOT been executed.	After the execution of IP detection is complete.
16#E2A5	The IP detection on the network module installed on the main backplane slot 5 has NOT been executed.	After the execution of IP detection is complete.
16#E2A6	The IP detection on the network module installed on the main backplane slot 6 has NOT been executed.	After the execution of IP detection is complete.
16#E2A7	The IP detection on the network module installed on the main backplane slot 7 has NOT been executed.	After the execution of IP detection is complete.
16#E2A8	The IP detection on the network module installed on the main backplane slot 8 has NOT been executed.	After the execution of IP detection is complete.
16#E2A9	The IP detection on the network module installed on the main backplane slot 9 has NOT been executed.	After the execution of IP detection is complete.
16#E2AA	The IP detection on the network module installed on the main backplane slot 10 has NOT been executed.	After the execution of IP detection is complete.
16#E2AB	The IP detection on the network module installed on the main backplane slot 11 has NOT been executed.	After the execution of IP detection is complete.

12.2.6 Troubleshooting for EtherNet/IP

Error Code	Description	How to fix them
16#B100	I/O Connections Duplicated	1. Check if the system has created the I/O connections. 2. Change the connection type to Listen Only.
16#B106	Ownership Conflict	1. Check the scanner owner. 2. Reconfigure the invalid scanner. 3. Change the connection to multicast.
16#B110	Target for Connection not Configured	1. Check the I/O connection status. 2. Activate the I/O connections again.
16#B111	Adapter RPI Not Supported	Check the RPI for the adapter.
16#B113	Out of Connections	1. Check if the connection exceeds the limit. 2. Reduce the number of the product connection.
16#B119	Non-Listen Only Not Opened	1. Check if the system has created the I/O connections. 2. Check the scanner I/O connection status.
16#B127	Invalid Originator to Target Size	1. Check the module number and the product setup file to see if they are matched.
16#B128	Invalid Target to Originator Size	2. Check the output size in the connection parameters.
16#B129	The configuration path parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
16#B12D	Consumed Tag does not exist.	Check if the parameters in the consumed tag are correctly set.
16#B12E	Produced Tag does not exist.	Check if the parameters in the produced tag are correctly set.
16#B203	I/O Connection Timeout	1. Check the network connection status. 2. Check if the module is working fine. 3. Increase the RPI value.
16#B204	Unconnected Request Timeout	No response from the adapter; check if the power and the network connection of the adapter are working properly.
16#B302	Network Bandwidth NOT Available for Data	1. Check the I/O connection limit between the scanner and the adapter. 2. Increase the RPI value or reduce the number of the connections.
16#B315	Invalid Segment in Connection Path	Check the module number and the product setup file to see if they are matched.

12.2.7 Others

Error Code	Description	Solution
16#000F	The original program in the PLC is damaged.	After users compile the program again, they can download the program again.
16#0024	There is no I/O module on a backplane.	Please check whether a module exists.
16#005D	The CPU module does not detect a memory card. (SM453)	Check whether a memory card is inserted into the CPU module correctly.
16#005E	The memory card is initialized incorrectly. (SM453)	Check whether the memory card breaks down.
16#005F	A nonexistent file is read from the memory card, or a nonexistent file is written to the memory card. (SM453)	Check whether the file path is correct.
16#0060	The CPU module can not create a default folder in the memory card. (SM453)	Check whether the capacity of the memory card is large enough, or whether the memory card breaks down.
16#0061	The capacity of the memory card is not sufficient. (SM453)	Check whether the capacity of the memory card is large enough.
16#0062	The memory card is write-protected. (SM453)	Check whether the memory card is write protected.
16#0063	An error occurs when data is written to the memory card. (SM453)	Check whether the file path is correct, or whether the memory card breaks down.
16#0064	A file in the memory card can not be read. (SM453)	Check whether the file path is correct, or whether the file is damaged.
16#0065	A file in the memory card is a read-only file. (SM453)	Users need to set the file so that the file is not a read-only file.
16#1001	The PLC CPU cannot read/write data on the modules.	Check and eliminate the problem. If the problem persists, contact the local authorized distributors.
16#1003	The mapped data between the PLC CPU and the modules is not right.	Check and eliminate the problem. If the problem persists, contact the local authorized distributors.
16#1420	The module Ethernet port is off.	Check if the module network cable is connected correctly.
16#1801	There is no interrupt service routine in the CPU module.	Check whether there is a corresponding interrupt task (24V low voltage interrupt service routine) in the program.
16#600A	TCP connection failure (SM1090)	1. Check the actual network configuration, and check whether the number of TCP connections exceeds the upper limit supported by the CPU module. 2. Retry the TCP connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy by means of the related flag in the program.)
16#600B	UDP connection failure (SM1091)	1. Check the actual network configuration, and check whether the number of UDP connections exceeds the upper limit supported by the CPU module. 2. Retry the TCP connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy by means of the related flag in the program.)

Error Code	Description	Solution
16#600C	The communication socket has been used. (SM1109)	1. Check whether the actual data access results in the use of the same socket. 2. Change the socket number, or retry the socket later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy by means of the related flag in the program.)
16#600D	The RJ45 port is not connected.	Check the communication cable.
16#600E	An RJ45 port on AH10EN-5A is not connected to a network cable.	Please check whether AH10EN-5A is connected to a network cable.
16#6100	The email connection is busy. (SM1113)	Retry the email connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy by means of the related flag in the program.)
16#6104	The attachment in the email does not exist. (SM1113)	Check whether the attachment exists in the memory card.
16#6105	The attachment in the email is oversized. (SM1113)	Check the size of the file which is specified as the attachment. If the size is over 2 MB, the file can not be specified as the attachment.
16#6107	There is an SMTP server response timeout. (SM1113)	1. Check whether the status of the SMTP server is normal. 2. Retry the sending of the email later. (This error does not cause the PLC to stop running. Users can perform the corresponding remedy by means of the related flag in the program.)
16#6201	The local communication port set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6202	The remote communication port set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6203	The device from which the data is sent in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6204	The transmitted data length set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6205	The data which is sent through the TCP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6206	The device which receives the data in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6207	The received data length set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.

Error Code	Description	Solution
16#6208	The data which is received through the TCP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620A	The local communication port set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620B	The remote communication port set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620C	The device from which the data is sent in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620D	The transmitted data length set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620E	The data which is sent through the UDP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#620F	The device which receives the data in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6210	The received data length set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6211	The data which is received through the UDP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6212	There is no response from the remote device after the timeout period. (Socket)	Make sure that the remote device is connected.
16#6213	The data received exceeds the limit. (Socket)	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG again.
16#6214	The remote device refuses the connection. (Socket)	Make sure that the remote device operates normally.
16#6215	The socket is not opened.	Check whether operational sequence in the program is correct.
16#6217	The socket is opened.	Check whether operational sequence in the program is correct.
16#6218	The data is being sent through the socket.	Check whether operational sequence in the program is correct.

Error Code	Description	Solution
16#6219	The data is being received through the socket.	Check whether operational sequence in the program is correct.
16#621A	The socket is closing.	Check whether operational sequence in the program is correct.
16#6303	The remote device in the Ether Link aborts the connection.	1. Check the connection and the status of the remote device. 2. Check whether the remote device supports the Ether Link.
16#6304	The connection in the Ether Link is busy.	1. Check whether the number of connections in the Ether Link exceeds the system load. 2. Retry the connection in the Ether Link later.
16#6309	The remote device in the Ether Link does not respond after the timeout period.	1. Check whether the CPU module in the Ether Link operates normally. 2. Check whether the CPU modules are connected normally.
16#6400	The number of TCP connections reaches the upper limit, or the flag which is related to the sending of the data is not set to ON. (EMDRW)	1. Check whether the flag which is related to the sending of the data in the program is modified. 2. Retry the setting of the flag and the sending of the packet.
16#6401	The remote device aborts the connection. (EMDRW)	Check whether the remote device support the Modbus port (502).
16#6402	There is no response from the remote device after the timeout period. (EMDRW)	Check whether the remote device operate normally.
16#6403	The remote IP address is illegal. (EMDRW)	Check whether the program is correct.
16#6404	The function code is NOT supported. (EMDRW)	Check the command transmitted from the remote device.
16#6405	The number of data received is not consistent with the actual length of the data. (EMDRW)	Check the command transmitted from the remote device.
16#6501	The remote device involved in the data exchange does not respond after the timeout period. (SM828~SM955)	Check the device whose connection number corresponds to the error flag, and check whether it is connected normally.
16#6502	The remote device involved in the data exchange does not respond correctly. (SM828~SM955)	Check the device whose connection number corresponds to the error flag, and check whether it is connected normally.
16#6600	The network number which receives the command exceeds the range.	Check the command transmitted from the remote device.
16#6601	The network is undefined in the network configuration parameter.	Check the network configuration in NWCONFIG, and download it again.
16#6604	The number of routing connections reaches the upper limit.	Resend the packet later. ((This error does not cause the PLC to stop running. Users can perform the corresponding remedy by means of the related flag in the program.)
16#6605	The unexpected packet is received.	Check the command transmitted from the remote device.

Error Code	Description	Solution
16#6606	There is a routing response timeout.	1. Check the network configuration in NWCONFIG. 2. Check whether the setting of the communication timeout conform to the practical application.
16#6700	An error occurs when a Modbus TCP data exchange is initialized.	Please check setting values, and download them again.
16#6701	Modbus TCP data exchange timeout	Please check whether the remote device supports the Modbus communication protocol.
16#6702	The data received by means of a Modbus TCP data exchange is incorrect.	Please check whether the remote device supports the Modbus communication protocol.
16#7002	The CPU module does not support the function.	Please check the version of the firmware installed on the CPU module.
16#7203	Invalid access code	Please check the contents of the packet sent by the remote device.
16#7401	Function code error	Please check the contents of the packet sent by the remote device.
16#7402	The size of a packet exceeds the maximum data length.	Please check the contents of the packet sent by the remote device.
16#7404	Packet format error	Please check the contents of the packet sent by the remote device.
16#7405	The number of bytes is incorrect.	Please check the contents of the packet sent by the remote device.
16#7406	Checksum error	Please check the contents of the packet sent by the remote device.
16#7407	There are non-ASCII characters in a command.	Please check the contents of the packet sent by the remote device.
16#7408	The PLC is running.	When the PLC is running, data such as a program and CPU parameters can not be downloaded to the PLC.
16#740A	Data is being written to the memory in the PLC or data fails to be written to the memory in the PLC.	Data is being written to the flash memory/SD card. Please try again later.
16#740B	The CPU module is being reset, or the values in the laching devices are being cleared.	The CPU module is being reset, or the values in the laching devices are being cleared. Please try again later.
16#740C	The backplane number in a communication command is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSoft, and contact the local authorized distributors.
16#740D	The slot number in a communication command is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSoft, and contact the local authorized distributors.
16#740E	An error occurs when the the data in the memory in the PLC is cleared.	Please try agin. If the problem persists, contact the local authorized distributors.
16#740F	Communication timeout	Please check whether the remote device operates normally.
16#7410	The function code in a reply command is incorrect.	Please check the contents of the packet sent by the remote device.
16#7412	Owing to the fact that SW1 is ON, data can not be downloaded to the CPU module.	Please make sure that SW1 is OFF.

16#757D	The remaining number of PLC password guesses is 0.	Please power the CPU module again.
16#757E	The PLC password entered is incorrect.	Please check whether the PLC password entered is correct.
16#8105	The contents of the program downloaded are incorrect. The program syntax is incorrect.	1. Check whether the program syntax which is not supported by the CPU module is used, and check whether the version of the firmware has its special limitation. 2. Check whether the version of ISPSoft used to create the program is the same as the version of ISPSoft used now.
16#8106	The contents of the program downloaded are incorrect. The length of the execution code exceeds the limit.	1. Shorten the length of the program, and download the program again. 2. Check whether the version of ISPSoft used to create the program is the same as the version of ISPSoft used now.
16#8107	The contents of the program downloaded are incorrect. The length of the source code exceeds the limit.	1. Shorten the length of the program, and download the program again. 2. Check whether the version of ISPSoft used to create the program is the same as the version of ISPSoft used now.
16#8230	A CPU parameter downloaded is incorrect. The IP address is illegal.	Please check the Ethernet parameters downloaded.
16#8231	A CPU parameter downloaded is incorrect. The netmask address is illegal.	Please check the Ethernet parameters downloaded.
16#8232	A CPU parameter downloaded is incorrect. The gateway address is illegal.	Please check the Ethernet parameters downloaded.
16#8233	A CPU parameter downloaded is incorrect. The IP address filter is set incorrectly.	Please check the Ethernet parameters downloaded.
16#8235	A CPU parameter downloaded is incorrect. The static ARP table is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#8236	A CPU parameter downloaded is incorrect. The NTP client service is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#8239	A CPU parameter downloaded is incorrect. The email sending function is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823A	A CPU parameter downloaded is incorrect. The condition for the sending of an email is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823B	A CPU parameter downloaded is incorrect. A TCP socket is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.

16#823C	A CPU parameter downloaded is incorrect. A UDP socket is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#823E	A CPU parameter downloaded is incorrect. The web function is set incorrectly.	1. Check the Ethernet parameters for the CPU module in HWCONFIG. 2. Check whether the version of HWCONFIG is compatible with the version of the CPU module.
16#8240	A CPU parameter downloaded is incorrect. The data exchange by means of Ethernet is set incorrectly	Modify the setting, and download it again.
16#8241	The setting of a DNS server is incorrect.	Modify the setting, and download it again.
16#8522	A module configuration is being scanned.	The module configuration is being scanned.
16#853B	An I/O module is not configured.	Check whether the module configuration in HWCONFIG is correct.
16#853C	An I/O module does not exist.	Check whether the module configuration in HWCONFIG is correct.
16#854B	An I/O module is not configured.	Check whether the module configuration in HWCONFIG is correct.
16#854C	An I/O module does not exist.	Check whether the module configuration in HWCONFIG is correct.
16#8572	The checksum of the module configuration table is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSoft, and contact the local authorized distributors.
16#8576	The checksum of the module parameter setting is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSoft, and contact the local authorized distributors.
16#857A	The checksum of the module parameter mapping table is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSoft, and contact the local authorized distributors.
16#85E1	An I/O interrupt number is incorrect.	Please check the version of the firmware installed on the CPU module and the version of ISPSoft, and contact the local authorized distributors.
16#85E2	IAn I/O interrupt service routine does not exist.	Check whether the corresponding interrupt service routine is downloaded to the CPU module.
16#860F	System restoration error	1. The contents of the system backup file are incorrect, or the file does not exist in the path specified. 2. If the file exists and the procedure of restoring the system can not be executed, please backing up the system again. 3. If the error still occurs, please contact the local authorized distributors.
16#8611	No memory card exists, or the memory card format is incorrect.	No memory card is detected. Please format the memory card, and try again.
16#8612	An error occurs when data is accessed from the memory card, or the memory card is in read-only mode.	Please make sure that the memory card is not in read-only mode, and try again.
16#8F03	A node number is undefined.	Modify the instruction and the network parameters, and download them again.

Error Code	Description	Solution
16#9A01	The setting of the data exchange for slave 1 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A02	The setting of the data exchange for slave 2 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A03	The setting of the data exchange for slave 3 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A04	The setting of the data exchange for slave 4 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A05	The setting of the data exchange for slave 5 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A06	The setting of the data exchange for slave 6 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A07	The setting of the data exchange for slave 7 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A08	The setting of the data exchange for slave 8 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A09	The setting of the data exchange for slave 9 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0A	The setting of the data exchange for slave 10 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0B	The setting of the data exchange for slave 11 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0C	The setting of the data exchange for slave 12 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0D	The setting of the data exchange for slave 13 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0E	The setting of the data exchange for slave 14 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A0F	The setting of the data exchange for slave 15 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A10	The setting of the data exchange for slave 16 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A11	The setting of the data exchange for slave 17 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.

Error Code	Description	Solution
16#9A12	The setting of the data exchange for slave 18 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A13	The setting of the data exchange for slave 19 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A14	The setting of the data exchange for slave 20 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A15	The setting of the data exchange for slave 21 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A16	The setting of the data exchange for slave 22 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A17	The setting of the data exchange for slave 23 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A18	The setting of the data exchange for slave 24 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A19	The setting of the data exchange for slave 25 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1A	The setting of the data exchange for slave 26 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1B	The setting of the data exchange for slave 27 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1C	The setting of the data exchange for slave 28 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1D	The setting of the data exchange for slave 29 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1E	The setting of the data exchange for slave 30 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A1F	The setting of the data exchange for slave 31 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A20	The setting of the data exchange for slave 32 in the PLC Link is incorrect. (SM1590)	1. Check the program and the related special data registers. 2. Set the PLC Link parameter in HWCONFIG again.
16#9A21	An error occurs when the master communicates with slave 1 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 1. 2. Check the communication cable.
16#9A22	An error occurs when the master communicates with slave 2 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 2. 2. Check the communication cable.

Error Code	Description	Solution
16#9A23	An error occurs when the master communicates with slave 3 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 3. 2. Check the communication cable.
16#9A24	An error occurs when the master communicates with slave 4 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 4. 2. Check the communication cable.
16#9A25	An error occurs when the master communicates with slave 5 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 5. 2. Check the communication cable.
16#9A26	An error occurs when the master communicates with slave 6 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 6. 2. Check the communication cable.
16#9A27	An error occurs when the master communicates with slave 7 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 7. 2. Check the communication cable.
16#9A28	An error occurs when the master communicates with slave 8 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 8. 2. Check the communication cable.
16#9A29	An error occurs when the master communicates with slave 9 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 9. 2. Check the communication cable.
16#9A2A	An error occurs when the master communicates with slave 10 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 10. 2. Check the communication cable.
16#9A2B	An error occurs when the master communicates with slave 11 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 11. 2. Check the communication cable.
16#9A2C	An error occurs when the master communicates with slave 12 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 12. 2. Check the communication cable.
16#9A2D	An error occurs when the master communicates with slave 13 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 13. 2. Check the communication cable.
16#9A2E	An error occurs when the master communicates with slave 14 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 14. 2. Check the communication cable.
16#9A2F	An error occurs when the master communicates with slave 15 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 15. 2. Check the communication cable.
16#9A30	An error occurs when the master communicates with slave 16 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 16. 2. Check the communication cable.
16#9A31	An error occurs when the master communicates with slave 17 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 17. 2. Check the communication cable.
16#9A32	An error occurs when the master communicates with slave 18 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 18. 2. Check the communication cable.
16#9A33	An error occurs when the master communicates with slave 19 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 19. 2. Check the communication cable.

Error Code	Description	Solution
16#9A34	An error occurs when the master communicates with slave 20 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 20. 2. Check the communication cable.
16#9A35	An error occurs when the master communicates with slave 21 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 21. 2. Check the communication cable.
16#9A36	An error occurs when the master communicates with slave 22 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 22. 2. Check the communication cable.
16#9A37	An error occurs when the master communicates with slave 23 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 23. 2. Check the communication cable.
16#9A38	An error occurs when the master communicates with slave 24 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 24. 2. Check the communication cable.
16#9A39	An error occurs when the master communicates with slave 25 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 25. 2. Check the communication cable.
16#9A3A	An error occurs when the master communicates with slave 26 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 26. 2. Check the communication cable.
16#9A3B	An error occurs when the master communicates with slave 27 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 27. 2. Check the communication cable.
16#9A3C	An error occurs when the master communicates with slave 28 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 28. 2. Check the communication cable.
16#9A3D	An error occurs when the master communicates with slave 29 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 29. 2. Check the communication cable.
16#9A3E	An error occurs when the master communicates with slave 30 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 30. 2. Check the communication cable.
16#9A3F	An error occurs when the master communicates with slave 31 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 31. 2. Check the communication cable.
16#9A40	An error occurs when the master communicates with slave 32 in the PLC Link. (SM1591)	1. Check the communication setting in the master, and the communication setting in slave 32. 2. Check the communication cable.
16#9A41	There is no response from slave 1 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 1. 2. Check the communication cable.
16#9A42	There is no response from slave 2 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 2. 2. Check the communication cable.
16#9A43	There is no response from slave 3 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 3. 2. Check the communication cable.
16#9A44	There is no response from slave 4 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 4. 2. Check the communication cable.

Error Code	Description	Solution
16#9A45	There is no response from slave 5 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 5. 2. Check the communication cable.
16#9A46	There is no response from slave 6 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 6. 2. Check the communication cable.
16#9A47	There is no response from slave 7 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 7. 2. Check the communication cable.
16#9A48	There is no response from slave 8 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 8. 2. Check the communication cable.
16#9A49	There is no response from slave 9 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 9. 2. Check the communication cable.
16#9A4A	There is no response from slave 10 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 10. 2. Check the communication cable.
16#9A4B	There is no response from slave 11 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 11. 2. Check the communication cable.
16#9A4C	There is no response from slave 12 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 12. 2. Check the communication cable.
16#9A4D	There is no response from slave 13 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 13. 2. Check the communication cable.
16#9A4E	There is no response from slave 14 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 14. 2. Check the communication cable.
16#9A4F	There is no response from slave 15 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 15. 2. Check the communication cable.
16#9A50	There is no response from slave 16 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 16. 2. Check the communication cable.
16#9A51	There is no response from slave 17 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 17. 2. Check the communication cable.
16#9A52	There is no response from slave 18 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 18. 2. Check the communication cable.
16#9A53	There is no response from slave 19 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 19. 2. Check the communication cable.
16#9A54	There is no response from slave 20 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 20. 2. Check the communication cable.
16#9A55	There is no response from slave 21 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 21. 2. Check the communication cable.

Error Code	Description	Solution
16#9A56	There is no response from slave 22 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 22. 2. Check the communication cable.
16#9A57	There is no response from slave 23 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 23. 2. Check the communication cable.
16#9A58	There is no response from slave 24 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 24. 2. Check the communication cable.
16#9A59	There is no response from slave 25 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 25. 2. Check the communication cable.
16#9A5A	There is no response from slave 26 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 26. 2. Check the communication cable.
16#9A5B	There is no response from slave 27 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 27. 2. Check the communication cable.
16#9A5C	There is no response from slave 28 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 28. 2. Check the communication cable.
16#9A5D	There is no response from slave 29 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 29. 2. Check the communication cable.
16#9A5E	There is no response from slave 30 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 30. 2. Check the communication cable.
16#9A5F	There is no response from slave 31 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 31. 2. Check the communication cable.
16#9A60	There is no response from slave 32 in the PLC Link. (SM1592)	1. Check the communication setting in the master, and the communication setting in slave 32. 2. Check the communication cable.
16#9A61	The setting of the PLC Link mode is incorrect. (SM1589)	Make sure that SM1586 and SM1587 are not both ON.
16#9A62	The number of polling cycles in the PLC Link is incorrect. (SM1592)	If the PLC Link is in the manual mode, please make sure that the number of polling cycles is within the range between 1 and 65535.
16#9A63	There is a handshaking timeout when the CPU module establishes a connection with the network module. (SM1596)	Check whether the network module operates normally.
16#9A64	There is no network module parameter in the CPU module. (SM1596)	Download the parameter in HWCONFIG again.
16#9B21	An error occurs when COM2 communicates with slave 1 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 1. 2. Check the communication cable.
16#9B22	An error occurs when COM2 communicates with slave 2 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 2. 2. Check the communication cable.

16#9B23	An error occurs when COM2 communicates with slave 3 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 3. 2. Check the communication cable.
16#9B24	An error occurs when COM2 communicates with slave 4 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 4. 2. Check the communication cable.
16#9B25	An error occurs when COM2 communicates with slave 5 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 5. 2. Check the communication cable.
16#9B26	An error occurs when COM2 communicates with slave 6 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 6. 2. Check the communication cable.
16#9B27	An error occurs when COM2 communicates with slave 7 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 7. 2. Check the communication cable.
16#9B28	An error occurs when COM2 communicates with slave 8 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 8. 2. Check the communication cable.
16#9B29	An error occurs when COM2 communicates with slave 9 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 9. 2. Check the communication cable.
16#9B2A	An error occurs when COM2 communicates with slave 10 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 10. 2. Check the communication cable.
16#9B2B	An error occurs when COM2 communicates with slave 11 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 11. 2. Check the communication cable.
16#9B2C	An error occurs when COM2 communicates with slave 12 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 12. 2. Check the communication cable.
16#9B2D	An error occurs when COM2 communicates with slave 13 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 13. 2. Check the communication cable.
16#9B2E	An error occurs when COM2 communicates with slave 14 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 14. 2. Check the communication cable.
16#9B2F	An error occurs when COM2 communicates with slave 15 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 15. 2. Check the communication cable.
16#9B30	An error occurs when COM2 communicates with slave 16 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 16. 2. Check the communication cable.
16#9B31	An error occurs when COM2 communicates with slave 17 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 17. 2. Check the communication cable.
16#9B32	An error occurs when COM2 communicates with slave 18 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 18. 2. Check the communication cable.
16#9B33	An error occurs when COM2 communicates with slave 19 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 19. 2. Check the communication cable.
16#9B34	An error occurs when COM2 communicates with slave 20 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 20. 2. Check the communication cable.

16#9B35	An error occurs when COM2 communicates with slave 21 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 21. 2. Check the communication cable.
16#9B36	An error occurs when COM2 communicates with slave 22 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 22. 2. Check the communication cable.
16#9B37	An error occurs when COM2 communicates with slave 23 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 23. 2. Check the communication cable.
16#9B38	An error occurs when COM2 communicates with slave 24 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 24. 2. Check the communication cable.
16#9B39	An error occurs when COM2 communicates with slave 25 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 25. 2. Check the communication cable.
16#9B3A	An error occurs when COM2 communicates with slave 26 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 26. 2. Check the communication cable.
16#9B3B	An error occurs when COM2 communicates with slave 27 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 27. 2. Check the communication cable.
16#9B3C	An error occurs when COM2 communicates with slave 28 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 28. 2. Check the communication cable.
16#9B3D	An error occurs when COM2 communicates with slave 29 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 29. 2. Check the communication cable.
16#9B3E	An error occurs when COM2 communicates with slave 30 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 30. 2. Check the communication cable.
16#9B3F	An error occurs when COM2 communicates with slave 31 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 31. 2. Check the communication cable.
16#9B40	An error occurs when COM2 communicates with slave 32 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 32. 2. Check the communication cable.
16#9B41	COM2 receives no response from slave 1 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 1. 2. Check the communication cable.
16#9B42	COM2 receives no response from slave 2 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 2. 2. Check the communication cable.
16#9B43	COM2 receives no response from slave 3 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 3. 2. Check the communication cable.
16#9B44	COM2 receives no response from slave 4 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 4. 2. Check the communication cable.
16#9B45	COM2 receives no response from slave 5 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 5. 2. Check the communication cable.
16#9B46	COM2 receives no response from slave 6 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 6. 2. Check the communication cable.

16#9B47	COM2 receives no response from slave 7 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 7. 2. Check the communication cable.
16#9B48	COM2 receives no response from slave 8 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 8. 2. Check the communication cable.
16#9B49	COM2 receives no response from slave 9 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 9. 2. Check the communication cable.
16#9B4A	COM2 receives no response from slave 10 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 10. 2. Check the communication cable.
16#9B4B	COM2 receives no response from slave 11 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 11. 2. Check the communication cable.
16#9B4C	COM2 receives no response from slave 12 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 12. 2. Check the communication cable.
16#9B4D	COM2 receives no response from slave 13 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 13. 2. Check the communication cable.
16#9B4E	COM2 receives no response from slave 14 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 14. 2. Check the communication cable.
16#9B4F	COM2 receives no response from slave 15 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 15. 2. Check the communication cable.
16#9B50	COM2 receives no response from slave 16 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 16. 2. Check the communication cable.
16#9B51	COM2 receives no response from slave 17 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 17. 2. Check the communication cable.
16#9B52	COM2 receives no response from slave 18 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 18. 2. Check the communication cable.
16#9B53	COM2 receives no response from slave 19 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 19. 2. Check the communication cable.
16#9B54	COM2 receives no response from slave 20 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 20. 2. Check the communication cable.
16#9B55	COM2 receives no response from slave 21 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 21. 2. Check the communication cable.
16#9B56	COM2 receives no response from slave 22 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 22. 2. Check the communication cable.
16#9B57	COM2 receives no response from slave 23 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 23. 2. Check the communication cable.
16#9B58	COM2 receives no response from slave 24 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 24. 2. Check the communication cable.

16#9B59	COM2 receives no response from slave 25 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 25. 2. Check the communication cable.
16#9B5A	COM2 receives no response from slave 26 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 26. 2. Check the communication cable.
16#9B5B	COM2 receives no response from slave 27 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 27. 2. Check the communication cable.
16#9B5C	COM2 receives no response from slave 28 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 28. 2. Check the communication cable.
16#9B5D	COM2 receives no response from slave 29 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 29. 2. Check the communication cable.
16#9B5E	COM2 receives no response from slave 30 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 30. 2. Check the communication cable.
16#9B5F	COM2 receives no response from slave 31 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 31. 2. Check the communication cable.
16#9B60	COM2 receives no response from slave 32 by Modbus.	1. Check the communication setting in the master, and the communication setting in slave 32. 2. Check the communication cable.

12.3 Troubleshooting for I/O Modules

- **The introduction of modules**
  Digital I/O modules, analog I/O modules, network modules, temperature measurement modules, and motion control modules can be installed in an AH500 system. Please refer to AH500 Module Manual for more information about the specifications for I/O modules. The error codes and the remedies for the errors are listed below.

12.3.1 Troubleshooting for Analog I/O Modules and Temperature Measurement Modules

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Error code	Description	Remedy
16#A000	The signal received by channel 0 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 0 exceeds the range of inputs which can be received by the hardware.
16#A001	The signal received by channel 1 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 1 exceeds the range of inputs which can be received by the hardware.
16#A002	The signal received by channel 2 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 2 exceeds the range of inputs which can be received by the hardware.
16#A003	The signal received by channel 3 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 3 exceeds the range of inputs which can be received by the hardware.
16#A004	The signal received by channel 4 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 4 exceeds the range of inputs which can be received by the hardware.
16#A005	The signal received by channel 5 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 5 exceeds the range of inputs which can be received by the hardware.
16#A006	The signal received by channel 6 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 6 exceeds the range of inputs which can be received by the hardware.
16#A007	The signal received by channel 7 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator blinks.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 7 exceeds the range of inputs which can be received by the hardware.

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Error code	Description	Remedy
16#A400	The signal received by channel 0 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 0 exceeds the range of inputs which can be received by the hardware.
16#A401	The signal received by channel 1 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 1 exceeds the range of inputs which can be received by the hardware.
16#A402	The signal received by channel 2 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 2 exceeds the range of inputs which can be received by the hardware.
16#A403	The signal received by channel 3 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 3 exceeds the range of inputs which can be received by the hardware.
16#A404	The signal received by channel 4 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 4 exceeds the range of inputs which can be received by the hardware.
16#A405	The signal received by channel 5 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 5 exceeds the range of inputs which can be received by the hardware.
16#A406	The signal received by channel 6 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 6 exceeds the range of inputs which can be received by the hardware.
16#A407	The signal received by channel 7 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is ON.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 7 exceeds the range of inputs which can be received by the hardware.
16#A600	Hardware failure	1. Check whether the backplane is normal. 2. Check whether the module operate normally.
16#A601	The external voltage is abnormal.	Check whether the external 24 V power supply to the module is normal.
16#A602	Internal error The CJC is abnormal.	Please contact the local authorized distributors.
16#A603	Internal error The factory correction is abnormal.	Please contact the local authorized distributors.
16#A800	The signal received by channel 0 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 0 exceeds the range of inputs which can be received by the hardware.

Error code	Description	Remedy
16#A801	The signal received by channel 1 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 1 exceeds the range of inputs which can be received by the hardware.
16#A802	The signal received by channel 2 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 2 exceeds the range of inputs which can be received by the hardware.
16#A803	The signal received by channel 3 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 3 exceeds the range of inputs which can be received by the hardware.
16#A804	The signal received by channel 4 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 4 exceeds the range of inputs which can be received by the hardware.
16#A805	The signal received by channel 5 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether The signal received by channel 5 exceeds the range of inputs which can be received by the hardware.
16#A806	The signal received by channel 6 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 6 exceeds the range of inputs which can be received by the hardware.
16#A807	The signal received by channel 7 exceeds the range of inputs which can be received by the hardware. (The ERROR LED indicator is OFF.)	Check the module parameter in HWCONFIG. Check whether the signal received by channel 7 exceeds the range of inputs which can be received by the hardware.

12.3.2 Troubleshooting for AH02HC-5A / AH04HC-5A

Error code	Description	Remedy
16#A001	The linear accumulation in channel 0 exceeds the range.	To clear the linear accumulation, users need to set bit 1 in CR0 to ON by means of FROM/TO.
16#A002	The scale set for channel 0 exceeds the range.	Check the module parameter in HWCONFIG. The scale set for channel 0 should be in the range of 0 to 32767.
16#A003	The number of cycles set for channel 0 exceeds the range.	Check the module parameter in HWCONFIG. The number of cycles set for channel 0 should be in the range of 2 to 60.
16#A004	The comparison value set for channel 0 exceeds the range.	Check the module parameter in HWCONFIG. The comparison value set for channel 0 should be in the range of -999999999 to 999999999.
16#A005	A limit value set for channel 0 is incorrect.	Check the module parameter in HWCONFIG. A limit value of set for channel 0 should be in the range of -200000 to 200000.
16#A006	The interrupt number set for channel 0 exceeds the range.	Check the module parameter in HWCONFIG. The interrupt number set for channel 0 should be in the range of 0 to 31.
16#A011	The linear accumulation in channel 1 exceeds the range.	To clear the linear accumulation, users need to set bit 1 in CR28 to ON by means of FROM/TO.
16#A012	The scale set for channel 1 exceeds the range.	Check the module parameter in HWCONFIG. The scale set for channel 1 should be in the range of 0 to 32767.
16#A013	The number of cycles set for channel 1 exceeds the range.	Check the module parameter in HWCONFIG. The number of cycles set for channel 1 should be in the range of 2 to 60.
16#A014	The comparison value set for channel 1 exceeds the range.	Check the module parameter in HWCONFIG. The comparison value set for channel 1 should be in the range of -999999999 to 999999999.
16#A015	A limit value set for channel 1 is incorrect.	Check the module parameter in HWCONFIG. A limit value of set for channel 1 should be in the range of -200000 to 200000.
16#A016	The interrupt number set for channel 1 exceeds the range.	Check the module parameter in HWCONFIG. The interrupt number set for channel 1 should be in the range of 0 to 31.
16#A021	The linear accumulation in channel 2 exceeds the range.	To clear the linear accumulation, users need to set bit 1 in CR56 to ON by means of FROM/TO.
16#A022	The scale set for channel 2 exceeds the range.	Check the module parameter in HWCONFIG. The scale set for channel 2 should be in the range of 0 to 32767.
16#A023	The number of cycles set for channel 2 exceeds the range.	Check the module parameter in HWCONFIG. The number of cycles set for channel 2 should be in the range of 2 to 60.
16#A024	The comparison value set for channel 2 exceeds the range.	Check the module parameter in HWCONFIG. The comparison value set for channel 2 should be in the range of -999999999 to 999999999.
16#A025	A limit value set for channel 2 is incorrect.	Check the module parameter in HWCONFIG. A limit value of set for channel 2 should be in the range of -200000 to 200000.
16#A026	The interrupt number set for channel 2 exceeds the range.	Check the module parameter in HWCONFIG. The interrupt number set for channel 2 should be in the range of 0 to 31.

Error code	Description	Remedy
16#A031	The linear accumulation in channel 3 exceeds the range.	To clear the linear accumulation, users need to set bit 1 in CR84 to ON by means of FROM/TO.
16#A032	The scale set for channel 3exceeds the range.	Check the module parameter in HWCONFIG. The scale set for channel 3 should be in the range of 0 to 32767.
16#A033	The number of cycles set for channel 3 exceeds the range.	Check the module parameter in HWCONFIG. The number of cycles set for channel 3 should be in the range of 2 to 60.
16#A034	The comparison value set for channel 3 exceeds the range.	Check the module parameter in HWCONFIG. The comparison value set for channel 3 should be in the range of -999999999 to 999999999.
16#A035	A limit value set for channel 3 is incorrect.	Check the module parameter in HWCONFIG. A limit value of set for channel 3 should be in the range of -200000 to 200000.
16#A036	The interrupt number set for channel 3 exceeds the range.	Check the module parameter in HWCONFIG. The interrupt number set for channel 3 should be in the range of 0 to 31.

12.3.3 Troubleshooting for AH05PM-5A / AH10PM-5A / AH15PM-5A

The programs and the setting which are mentioned in the table below are edited in PMSoft version 2.02 or above.

Error code	Description	Remedy
16#A002	The subroutine has no data.	A program should be written in the subroutine.
16#A003	CJ, CJN, and JMP have no matching pointers.	Write the pointers which match CJ, CJN, and JMP respectively.
16#A004	There is a subroutine pointer in the main program.	The subroutine pointer can not be in the main program.
16#A005	Lack of the subroutine	The nonexistent subroutine can not be called.
16#A006	The pointer is used repeatedly in the same program.	The pointer can not be used repeatedly in the same program.
16#A007	The subroutine pointer is used repeatedly.	The subroutine pointer can not be used repeatedly.
16#A008	The pointer used in JMP is used repeatedly in different subroutines.	The pointer used in JMP can not be used repeatedly in different subroutines.
16#A009	The pointer used in JMP is the same as the pointer used in CALL.	The pointer used in JMP can not be the same as the pointer used in CALL.
16#A00A	The pointer used in JMP is the same as a subroutine pointer.	The pointer used in JMP can not be the same as a subroutine pointer.
16#A00B	Target position (I) of the single speed is incorrect.	The target position (I) of the single speed should be set correctly.
16#A00C	Target position (II) of the single-axis motion is incorrect.	Check whether target position (II) of the single-axis motion and target position (I) of the single-axis motion are in opposite directions.
16#A00D	The setting of speed (I) of the single-axis motion is incorrect.	Set the speed of the single-axis motion.
16#A00E	The setting of speed (II) of the single-axis motion is incorrect.	The setting value can not be zero.
16#A00F	The setting of the speed (V_{RT}) of returning to zero is incorrect.	Set the speed of returning to zero properly. (The setting value can not be zero.)
16#A010	The setting of the deceleration (V_{CR}) of returning to zero is incorrect.	Set the speed of returning to zero. The deceleration should be less than the speed of returning to zero. (The setting value can not be zero.)
16#A011	The setting of the JOG speed is incorrect.	The setting value can not be zero.
16#A012	The positive pulses generated by the single-axis clockwise motion are inhibited.	The error occurs because the limit sensor is triggered. Check the status of the limit sensor, and check whether the motor operates normally.
16#A013	The negative pulses generated by the single-axis counterclockwise motion are inhibited.	The error occurs because the limit sensor is triggered. Check the status of the limit sensor, and check whether the motor operates normally.
16#A014	The limit switch is reached.	The error occurs because the limit sensor is triggered. Check the status of the limit sensor, and check whether the motor operates normally.
16#A015	The device which is used exceeds the device range.	Use the device which does not exceed the device range.
16#A017	An error occurs when the device is modified by a 16-bit index register/32-bit index register.	Use the16-bit index register/32-bit index register which does not exceed the device range.
16#A018	The conversion into the floating-point number is incorrect.	Modify the operation to prevent the abnormal number from occurring.

Error code	Description	Remedy
16#A019	The conversion into the binary-coded decimal number is incorrect.	Modify the operation to prevent the abnormal number from occurring.
16#A01A	Incorrect division operation (The divisor is 0.)	Modify the operation to prevent the divisor from being zero.
16#A01B	General program error	Modify the program to make the syntax correct.
16#A01C	LD/LDI has been used more than nine times.	Modify the program to prevent LD/LDI from being used more than nine times.
16#A01D	There is more than one level of nested program structure supported by RPT/RPE.	Modify the program to prevent more than one level of nested program structure supported by RPT/RPE from being used.
16#A01E	SRET is used between RPT and RPE.	Modify the program to prevent SRET from being used between RPT and RPE.
16#A01F	There is no M102 in the main program, or there is no M2 in the motion program.	Modify the program so that there is M102 in the main program, or modify the program so that there is M2 in the motion program.
16#A020	The wrong instruction is used, or the device used exceeds the range.	Check and modify the program to prevent the wrong instruction from being used, or check whether the device used exceeds the device range.

12.3.4 Troubleshooting for AH20MC-5A

The programs and the setting which are mentioned in the table below are edited in PMSoft version 2.02 or above.

Error code	Description	Remedy
16#A002	The subroutine has no data.	A program should be written in the subroutine.
16#A003	CJ, CJN, and JMP have no matching pointers.	Write the pointers which match CJ, CJN, and JMP respectively.
16#A004	There is a subroutine pointer in the main program.	The subroutine pointer can not be in the main program.
16#A005	Lack of the subroutine	The nonexistent subroutine can not be called.
16#A006	The pointer is used repeatedly in the same program.	The pointer can not be used repeatedly in the same program.
16#A007	The subroutine pointer is used repeatedly.	The subroutine pointer can not be used repeatedly.
16#A008	The pointer used in JMP is used repeatedly in different subroutines.	The pointer used in JMP can not be used repeatedly in different subroutines.
16#A009	The pointer used in JMP is the same as the pointer used in CALL.	The pointer used in JMP can not be the same as the pointer used in CALL.
16#A00A	The pointer used in JMP is the same as a subroutine pointer.	The pointer used in JMP can not be the same as a subroutine pointer.
16#A00B	Target position (I) of the single speed is incorrect.	The target position (I) of the single speed should be set correctly.
16#A00C	Target position (II) of the single-axis motion is incorrect.	Check whether target position (II) of the single-axis motion and target position (I) of the single-axis motion are in opposite directions.
16#A00D	The setting of speed (I) of the single-axis motion is incorrect.	Set the speed of the single-axis motion.
16#A00E	The setting of speed (II) of the single-axis motion is incorrect.	The setting value can not be zero.
16#A00F	The setting of the speed (V_{RT}) of returning to zero is incorrect.	Set the speed of returning to zero properly. (The setting value can not be zero.)
16#A010	The setting of the deceleration (V_{CR}) of returning to zero is incorrect.	Set the speed of returning to zero. The deceleration should be less than the speed of returning to zero. (The setting value can not be zero.)
16#A011	The setting of the JOG speed is incorrect.	The setting value can not be zero.
16#A012	The positive pulses generated by the single-axis clockwise motion are inhibited.	The error occurs because the limit sensor is triggered. Check the status of the limit sensor, and check whether the motor operates normally.
16#A013	The negative pulses generated by the single-axis counterclockwise motion are inhibited.	The error occurs because the limit sensor is triggered. Check the status of the limit sensor, and check whether the motor operates normally.
16#A014	The limit switch is reached.	The error occurs because the limit sensor is triggered. Check the status of the limit sensor, and check whether the motor operates normally.
16#A015	The device which is used exceeds the device range.	Use the device which does not exceed the device range.
16#A017	An error occurs when the device is modified by a 16-bit index register/32-bit index register.	Use the 16-bit index register/32-bit index register which does not exceed the device range.
16#A018	The conversion into the floating-point number is incorrect.	Modify the operation to prevent the abnormal number from occurring.

Error code	Description	Remedy
16#A019	The conversion into the binary-coded decimal number is incorrect.	Modify the operation to prevent the abnormal number from occurring.
16#A01A	Incorrect division operation (The divisor is 0.)	Modify the operation to prevent the divisor from being zero.
16#A01B	General program error	Modify the program to make the syntax correct.
16#A01C	LD/LDI has been used more than nine times.	Modify the program to prevent LD/LDI from being used more than nine times.
16#A01D	There is more than one level of nested program structure supported by RPT/RPE.	Modify the program to prevent more than one level of nested program structure supported by RPT/RPE from being used.
16#A01E	SRET is used between RPT and RPE.	Modify the program to prevent SRET from being used between RPT and RPE.
16#A01F	There is no M102 in the main program, or there is no M2 in the motion program.	Modify the program so that there is M102 in the main program, or modify the program so that there is M2 in the motion program.
16#A020	The wrong instruction is used, or the device used exceeds the range.	Check and modify the program to prevent the wrong instruction from being used, or check whether the device used exceeds the device range.

12.3.5 Troubleshooting for AH10EN-5A / AH15EN-5A

Error code	Description	Remedy
16#A001	The IP address of host 1 conflicts with another system on the network.	1. Contact the network administrator, and check whether the IP address is correct. 2. Check the module parameter in HWCONFIG.
16#A002	The IP address of host 2 conflicts with another system on the network.	1. Contact the network administrator, and check whether the IP address is correct. 2. Check the module parameter in HWCONFIG.
16#A003	DHCP for host 1 fails.	Please contact the network administrator
16#A004	DHCP for host 2 fails.	Please contact the network administrator
16#A401	Hardware error	Please restore the hardware to the factory setting. If the error still occurs, please contact the local authorized distributors.
16#A402	The initialization of the system fails.	Please restore the system to the factory setting. If the error still occurs, please contact the local authorized distributors.

12.3.6 Troubleshooting for AH10SCM-5A / AH15SCM-5A

Error code	Description	Remedy
16#A002	The setting of the UD Link is incorrect, or the communication fails.	Check the setting in SCMSoft, and download the setting again.
16#A401	Hardware error	Please contact the local authorized distributors.
16#A804	The communication through the communication port is incorrect.	1. Check whether the communication cable is connected well. 2. Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#A808	Modbus communication error	1. Check whether the communication cable is connected well. 2. Check the parameter in HWCONFIG, and the parameter. Download the parameter again.

12.3.7 Troubleshooting for AH10DNET-5A

The parameters which are mentioned in the table below are set in DeviceNet Builder version 1.07 or above.

Error code	Description	Remedy
16#A0F0	The node ID of AH10DNET-5A is the same as other node ID on the network, or exceeds the range.	Make sure that the node ID of AH10DNET-5A is the only one on the network. If the node ID of AH10DNET-5A is not the only one on the network, please change the node ID, and supply power to AH10DNET-5 again.
16#A0F1	No slave is put on the scan list of AH10DNET-5A.	Put slaves on the scan list, and then download the scan list to AH10DNET-5A.
16#A0F2	The working voltage of AH10DNET-5A is low.	Check whether the working voltage of AH10DNET-5A and that of an AH500 series CPU module are normal.
16#A0F3	AH10DNET-5A enters the test mode.	Switch IN 1 on the module OFF, and supply power to AH10DNET-5A again.
16#A0F4	The bus of AH10DNET-5A becomes OFF.	1. Check whether the communication cable is normal, and whether the shielded cable is grounded. 2. Check whether the serial transmission speeds of other devices on the network are the same. 3. Check whether the both ends of the cable are connected to 121 Ω terminal resistors. 4. Supply power to AH10DNET-5A again.
16#A0F5	AH10DNET-5A detects that there is no power supply to the DeviceNet network.	Check whether the communication cable is normal, and whether the network power supply is normal.
16#A0F6	Something is wrong with the internal memory of AH10DNET-5A.	Supply power to AH10DNET-5A again. If the error still occurs, please contact the local authorized distributors.
16#A0F7	Something is wrong with the data exchange unit of AH10DNET-5A.	Supply power to AH10DNET-5A again. If the error still occurs, please contact the local authorized distributors.
16#A0F8	The product ID of AH10DNET-5A is incorrect.	Supply power to AH10DNET-5A again. If the error still occurs, please contact the local authorized distributors.
16#A0F9	An error occurs when the data is read from AH10DNET-5A, or when the data is written into AH10DNET-5A.	Supply power to AH10DNET-5A again. If the error still occurs, please contact the local authorized distributors.
16#A0FA	The node ID of AH10DNET-5A is the same as that of the slave set on the scan list.	Method 1: Set the node ID of AH10DNET-5A again. The new node ID can not be the same as the node ID of the slave set on the scan list. Supply power to AH10DNET-5A again. Method 2: Put no slave on the scan list, and download the blank scan list to AH10DNET-5A through the simulated online mode in the software. Supply power to AH10DNET-5A again.
16#A0FB	The data exchange between AH10DNET and AH CPU failed.	Supply power to the AH10DNET and AH CPU and try to exchange data again. If the issue continuses, contact the local authorized distributors.

Error code	Description	Remedy
16#A0FC	Errors occur in the slaves, on the module of an AHRTU-DNET backplane, or on the AHRTU-DNET backplane connection.	1. Check whether the node number has changed. 2. Check if the network connection cable is secured and working fine. 3. Check if the network transmission cable does not exceed the maximum communication distance (refer to AH500 module manual section 11.3.3 for more information). Do not exceed the maximum communication distance to ensure a stable network. 4. Check if the module on the backplane is working fine. 5. Check if the AHRTU-DNET backplane connection is working fine.

12.3.8 Troubleshooting for AH10PFBM-5A

Error code	Description	Remedy
16#A001	The master is not set.	Download appropriate setting.
16#A003	The master station enters the test mode.	Just repower it.
16#A005	A timeout occurs when chips inside the master station communicate.	Download the appropriate configuration again. If the error still occurs, please contact the local authorized distributors.
16#A00B	A timeout occurs when AH10PFBM-5A exchanges data exchange with a PLC.	Repower AH10PFBM-5A . If the error still occurs, please contact the local authorized distributors.
16#A402	The PLC does not assign the I/O mapping area to the master.	Assign the appropriate I/O mapping area to the master via ISPSoft.
16#A404	Master initializing error	Contact the factory if the error still exists after repowering AH10PFBM-5A.
16#A406	Internal storage unit error	Contact the factory if the error still exists after repowering AH10PFBM-5A.
16#A407	Data exchange unit error	Contact the factory if the error still exists after repowering AH10PFBM-5A.
16#A408	Master serial number detection error	Contact the factory if the error still exists after repowering AH10PFBM-5A.
16#A4E2	The master detects that the slave is offline.	1. Check whether the PROFIBUS-DP bus connection is normal. 2. Check whether both of the ends of the network have terminal resistors.
16#A4E6	The master detects that an error occurs in the module connected to AHRTU-PFBS-5A.	Check the modules connected to AHRTU-PFBS-5A.

12.3.9 Troubleshooting for AH10PFBS-5A

Error code	Description	Remedy
16#A4F0	The node address of AH10PFBS-5A exceeds the valid range.	The node address of AH10PFBS-5A must be in the range of 1 to 125.
16#A4F1	Internal hardware error	If the error still exists after repowering AH10PFBS-5A, replace it with a new one.
16#A4F2	Parameter error	Check whether the GSD file AH10PFBS-5A is using is correct.
16#A4F3	Configuration error	Check whether the GSD file AH10PFBS-5A is using is correct.
16#A4F4	GPIO detection error	If the error still exists after repowering AH10PFBS-5A, replace it with a new one.
16#A4F5	AH10PFBS-5A enters the mode of factory test.	Repower AH10PFBS-5A after setting its node address between 1~125.
16#A4F6	1. AH10PFBS-5A has not been connected to the PROFIBUS-DP network. 2. PROFIBUS-DP master has not configured AH10PFBS-5A slave or the configured node address of AH10PFBS-5A is inconsistent with that of the actually connected one.	1. Check whether the communication cable between AH10PFBS-5A and PROFIBUS-DP master is in normal status. 2. Ensure that AH10PFBS-5A slave has been configured to PROFIBUS-DP master and the configured node address of AH10PFBS-5A is consistent with that of the actually connected one. 3. Check whether the PROFIBUS-DP master works normally.

12.3.10 Troubleshooting for AH10COPM-5A

Error code	Description	Remedy
16#A0B0	AH10COPM-5A does not send a heartbeat message after a set period of time.	Check whether the bus cable on the CANopen network created is connected correctly.
16#A0B1	The length of a PDO that a slave station sends is not the same as the length of the PDO set in the node list.	Set the length of the PDO in the slave station again, and then download the setting to AH10COPM-5A.
16#A0B2	The master station selected does not send a node guarding message after a set period of time.	Check whether the bus cable on the CANopen network created is connected correctly.
16#A0E0	AH10COPM-5A receives an emergency message from a slave station.	Use the function block CANopen_EMCY to read relevant information.
16#A0E1	The length of a PDO that a slave station sends is not the same as the length of the PDO set in the node list.	Set the length of the PDO in the slave station again, and then download the setting to AH10COPM-5A.
16#A0E2	AH10COPM-5A does not receive a PDO from a slave station.	Make sure that the PDOs in the slave station are set correctly.
16#A0E3	An automatic SDO is not downloaded successfully.	Make sure that the automatic SDO is et correctly.
16#A0E4	A PDO parameter is not set successfully.	Make sure that the setting of the PDO parameter is legal.
16#A0E5	A key parameter is set incorrectly.	Make sure that the slave stations connected are the same as the slave stations set.
16#A0E6	The actual network configuration is not the same as the network configuration set.	Make sure that the power supplied to the slave stations connected is normal and the network created is connected correctly.
16#A0E7	The control of the errors in a slave station is not sent after a set period of time.	
16#A0E8	The master station address is the same as a slave station address.	Set the master station address or the slave station address again, and make sure the new station address is not the same as a slave station address.
16#A0F1	No slave station is added to the node list in CANopen builder.	Add slave stations to the node list, and download the configuration to AH10COPM-5A.
16#A0F3	An error occurs in AH10COPM-5A.	Download parameters again. If the error still occurs, please replace AH10COPM-5A.
16#A0F4	The bus used is off.	Please check whether the bus cable on the CANopen network created is connected correctly, make sure that the serial transmission speeds of all the nodes on the network are the same, and power AH10COPM-5A again.
16#A0F5	The node address of AH10COPM-5A is set incorrectly.	The node address of AH10COPM-5A must be in the range of 1 to 127.
16#A0F6	Internal error: An error occurs in the manufacturing process in the factory.	Power AH10COPM-5A again. If the error still occurs, please replace AH10COPM-5A.
16#A0F7	Internal error: GPIO error	

Error code	Description	Remedy
16#A0F8	Hardware error	
16#A0F9	Low voltage	Make sure that the power supplied to AH10COPM-5A is normal.
16#A0FA	An error occurs in the firmware of AH10COPM-5A.	Power AH10COPM-5A again.
16#A0FB	The transmission registers in AH10COPM-5A are full.	Please make sure that the bus cable on the CANopen network created is connected correctly, and power AH10COPM-5A again.
16#A0FC	The reception registers in AH10COPM-5A are full.	Please make sure that the bus cable on the CANopen network created is connected correctly, and power AH10COPM-5A again.

12.4 Error Codes and LED Indicators

A. Columns

a. Error code: If the error occurs in the system, the error code is generated.

b. Description: The description of the error

c. CPU status: If the error occurs, the CPU stops running, keeps running, or in the status defined by users.

- Stop: The CPU stops running when the error occurs.
- Continue: The CPU keeps running when the error occurs.
- Self-defined: The status of the CPU can be defined by users. Please refer to section 8.2.1 in this manual for more information.

d. LED indicator status: If the error occurs, the LED indicator is ON, OFF, or blinks.

- ERROR: The system error
- BUS FAULT: The I/O bus error
- Module ERROR: The module error

- **LED indicators**

	LED indicator	Description
CPU	ERROR	The status of the CPU ON: A serious error occurs in the system. OFF: The system is normal. Blinking: A slight error occurs in the system.
	BUS FAULT	The status of the I/O bus ON: A serious error occurs in the I/O bus. OFF: The I/O bus is normal. Blinking: A slight error occurs in the I/O bus.
Module	ERROR	The status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.

12.4.1 CPU Modules

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#000A	Scan timeout (SM8: The watchdog timer error)	Stop	Blinking	Keep
16#000B	The program in the PLC is damaged.	Stop	ON	Keep
16#000C	The program downloaded to the PLC is incorrect.	Stop	Blinking	Keep
16#000D	The CPU parameter is damaged.	Stop	ON	Keep
16#000E	The program or the parameter is being downloaded, and therefore the PLC can not run.	Stop	Blinking	Keep
16#000F	The original program in the PLC is damaged.	Continue	Keep	Keep
16#0010	The access to the memory in the CPU is denied.	Stop	ON	Keep
16#0011	The PLC ID is incorrect. (SM9)	Continue	ON	Keep
16#0012	The PLC password is incorrect.	Continue	ON	Keep
16#0013	The I/O module can not run/stop. (SM10)	Stop	Keep	ON
16#0014	The procedure of restoring the system can not be executed. (SM9)	Stop	ON	ON
16#0015	The module table is incorrect. (SM10)	Stop	ON	Keep
16#0016	The module setting is incorrect. (SM10)	Stop	ON	Keep
16#0017	The device which is associated with the data register is incorrect. (SM10)	Stop	ON	Keep
16#0018	The serial port is abnormal. (SM9)	Continue	Blinking	Keep
16#0019	The USB is abnormal. (SM9)	Continue	Blinking	Keep
16#001A	The contents of the system backup file (DUP) are incorrect.	Stop	ON	Keep
16#001B	Timed interrupt 0 is set incorrectly.	Stop	ON	Keep
16#001C	Timed interrupt 1 is set incorrectly.	Stop	ON	Keep
16#001D	Timed interrupt 2 is set incorrectly.	Stop	ON	Keep
16#001E	Timed interrupt 3 is set incorrectly.	Stop	ON	Keep
16#001F	The watchdog timer is set incorrectly.	Stop	ON	Keep
16#0020	The setting of the fixed scan time is incorrect.	Stop	ON	Keep
16#0021	The setting of the fixed scan time is incorrect.	Stop	ON	Keep
16#0022	The CPU parameter downloaded to the PLC is incorrect.	Stop	ON	Keep
16#0023	The Y state (STOP->RUN) section in the PLC Parameter Setting window is set incorrectly.	Stop	ON	Keep
16#0024	There is no I/O module on a backplane.	Continue	Keep	Keep
16#0025	The initial value of the symbol is not consistant with what is set in the program.	Stop	ON	Keep
16#0026	The latching auxiliary relay range which is set is incorrect.	Stop	ON	Keep
16#0027	The latching data register range which is set is incorrect.	Stop	ON	Keep
16#0028	The latching timer range which is set is incorrect.	Stop	ON	Keep
16#0029	The latching counter range which is set is incorrect.	Stop	ON	Keep
16#002A	The latching 32-bit counter range which is set is incorrect.	Stop	ON	Keep
16#002B	The latching auxiliary relay range which is set is incorrect.	Stop	ON	Keep
16#0033	The communication setting of COM1 is incorrect. (SM9)	Continue	Blinking	Keep
16#0034	The setting of the station address of COM1 is incorrect. (SM9)	Continue	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#0035	The setting of the communication type of COM1 is incorrect. (SM9)	Continue	Blinking	Keep
16#0038	The communication setting of COM2 is incorrect. (SM9)	Continue	Blinking	Keep
16#0039	The setting of the station address of COM2 is incorrect. (SM9)	Continue	Blinking	Keep
16#003A	The setting of the communication type of COM2 is incorrect. (SM9)	Continue	Blinking	Keep
16#0050	The memories in the latched special auxiliary relays are abnormal.	Continue	ON	Keep
16#0051	The latched special data registers are abnormal.	Continue	ON	Keep
16#0052	The memories in the latched auxiliary relays are abnormal.	Continue	ON	Keep
16#0053	The latched timers are abnormal.	Continue	ON	Keep
16#0054	The latched counters are abnormal.	Continue	ON	Keep
16#0055	The latched 32-bit counters are abnormal.	Continue	ON	Keep
16#0056	The memories in the latched timers are abnormal.	Continue	ON	Keep
16#0057	The memories in the latched counters are abnormal.	Continue	ON	Keep
16#0058	The memories in the latched 32-bit counters are abnormal.	Continue	ON	Keep
16#0059	The latched data registers are abnormal.	Continue	ON	Keep
16#005A	The latched working registers are abnormal.	Continue	ON	Keep
16#005B	Abnormal SFC parameters	Continue	ON	Keep
16#005D	The CPU module does not detect a memory card. (SM453)	Continue	Blinking	Keep
16#005E	The memory card is initialized incorrectly. (SM453)	Continue	Blinking	Keep
16#005F	The data is read from the inexistent file in the memory card, or the data is written into the inexistent file in the memory card. (SM453)	Continue	Blinking	Keep
16#0060	The default folder can not be created in the CPU module. (SM453)	Continue	Blinking	Keep
16#0061	The capacity of the memory card is not large enough. (SM453)	Continue	Blinking	Keep
16#0062	The memory card is write protected. (SM453)	Continue	Blinking	Keep
16#0063	An error occurs when the data is written into the memory card. (SM453)	Continue	Blinking	Keep
16#0064	The file in the memory card can not be read. (SM453)	Continue	Blinking	Keep
16#0065	The file in the memory card is a read-only file. (SM453)	Continue	Blinking	Keep
16#0066	An error occurs when the system is backupped.	Continue	Blinking	Keep
16#0067	The size of the PLC parameters restored exceeds the size of the PLC parameters of the CPU module.	Continue	Blinking	Keep
16#0068	Corrupted symbol table	Stop	Blinking	Keep
16#0069	Corrutped EIP parameters	Stop	Blinking	Keep
16#1001	The PLC CPU cannot read/write data on the modules.	Continue	Keep	Blinking
16#1003	The mapped data between the PLC CPU and the modules is not right.	Continue	Keep	Blinking
16#1400	An error occurs when the data is accessed through the auxiliary processor. (SM9)	Stop	Keep	ON
16#1401	An error occurs when the data in the I/O module is accessed. (SM9)	Stop	Keep	ON

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#1402	The actual arrangement of the I/O modules is not consistent with the module table. (SM9)	Stop	Keep	ON
16#1403	An error occurs when the data is read from the module. (SM9)	Stop	Keep	ON
16#1405	The setting parameter of the module is not found. (SM9)	Stop	Keep	ON
16#1407	A communication error occurs when the data is accessed through the auxiliary processor. (SM9)	Continue	ON	Keep
16#1409	The extension backplane is disconnected. (SM9)	Stop	Keep	ON
16#140A	The communication with the extension backplane is incorrect. (SM9)	Stop	Keep	ON
16#140B	The number of network modules exceeds the limit. (SM9)	Stop	Keep	ON
16#140C	The checksum of the high-speed data exchange is incorrect. (SM9)	Stop	Keep	ON
16#140D	The ID of the actual power supply module is not the same as the ID of the power supply module set in HWCONFIG. (SM9)	Stop	Keep	ON
16#140E	The amount of data exchanged at a high speed exceeds the maximum amount supported. (SM10)	Stop	Keep	ON
16#140F	High-speed data exchange error (SM11)	Stop	Keep	ON
16#1801	There is no interrupt service routine in the CPU module.	Continue	Keep	Keep
16#2000	There is no END in the program in the PLC. (SM5)	Stop	Blinking	Keep
16#2001	The program is incorrect. There is a syntax error. (SM5)	Stop	Blinking	Keep
16#2002	GOEND is used incorrectly. (SM5)	Stop	Blinking	Keep
16#2003	The devices used in the program exceed the range. (SM0/SM5)	Self-defined	Blinking	Keep
16#2004	The part of the program specified by the label used in CJ/JMP is incorrect, or the label is used repeatedly. (SM0/SM5)	Stop	Blinking	Keep
16#2005	The N value used in MC is not the same as the corresponding N value used in MCR, or the number of N values used in MC is not the same as the number of N values used in MCR. (SM5)	Stop	Blinking	Keep
16#2006	The N values used in MC do not start from 0, or the N values used in MC are not continuous. (SM5)	Stop	Blinking	Keep
16#2007	The operands used in ZRST are not used properly. (SM5)	Stop	Blinking	Keep
16#200A	Invalid instruction (SM5)	Stop	Blinking	Keep
16#200B	The operand **n** or the other constant operands exceed the range. (SM0/SM5)	Self-defined	Blinking	Keep
16#200C	The operands overlap. (SM0/SM5)	Self-defined	Blinking	Keep
16#200D	An error occurs when the binary number is converted into the binary-coded decimal number. (SM0/SM5)	Self-defined	Blinking	Keep
16#200E	The string does not end with 0x00. (SM0/SM5)	Self-defined	Blinking	Keep
16#200F	The instruction does not support the modification by an index register. (SM5)	Stop	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#2010	1. The instruction does not support the device. 2. Encoding error 3. The instruction is a 16-bit instruction, but the constant operand is a 32-bit code. (SM5)	Stop	Blinking	Keep
16#2011	The number of operands is incorrect. (SM5)	Stop	Blinking	Keep
16#2012	Incorrect division operation (SM0/SM5).	Self-defined	Blinking	Keep
16#2013	The value exceeds the range of values which can be represented by the floating-point numbers. (SM0/SM5)	Self-defined	Blinking	Keep
16#2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range. (SM5)	Stop	Blinking	Keep
16#2015	There are more than 32 levels of nested program structures supported by CALL. (SM0)	Self-defined	Blinking	Keep
16#2016	There are more than 32 levels of nested program structures supported by FOR/NEXT. (SM0/SM5)	Self-defined	Blinking	Keep
16#2017	The number of times FOR is used is different from the number of times NEXT is used. (SM5)	Stop	Blinking	Keep
16#2018	There is a label after FEND, but there is no SRET. There is SRET, but there is no label. (SM5)	Stop	Blinking	Keep
16#2019	The interrupt task is not after FEND. (SM5)	Stop	Blinking	Keep
16#201A	IRET/SRET is not after FEND. (SM5)	Stop	Blinking	Keep
16#201B	There is an interrupt task, but there is no IRET. There is IRET, but there is not interrupt task. (SM5)	Stop	Blinking	Keep
16#201C	End is not at the end of the program. (SM5)	Stop	Blinking	Keep
16#201D	There is CALL, but there is no MAR. (SM5)	Stop	Blinking	Keep
16#201E	The function code used in MODRW is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#201F	The length of the data set in MODRW is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#2020	The communication command received by using MODRW is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#2021	The checksum of the command received is incorrect. (SM102/SM103)	Self-defined	Blinking	Keep
16#2022	The format of the command used in MODRW does not conform to the ASCII format. (SM102/SM103)	Self-defined	Blinking	Keep
16#2023	A communication timeout occurred in the execution of MODRW instruction. (SM120/SM103)	Self-defined	Blinking	Keep
16#2024	The setting value of the communication timeout is invalid in the execution of RS instruction. (SM120/SM103)	Self-defined	Blinking	Keep
16#2025	A communication timeout occurred in the execution of RS instruction. (SM120/SM103)	Self-defined	Blinking	Keep
16#2026	The interrupt index is abnormal in the execution of RS instruction. (SM102/104)	Self-defined	OFF	Keep
16#2027	The execution of FWD instruction is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#2028	The execution of REV instruction is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#2029	The execution of STOP instruction is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#202A	The execution of RSDT instruction is abnormal. (SM102/103)	Self-defined	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#202B	The execution of RSTEF instruction is abnormal. (SM102/103)	Self-defined	Blinking	Keep
16#202C | 16#204B	I/O interrupt service routine 0 does not exist. | I/O interrupt service routine 31 does not exist.	Stop	Blinking	Keep
16#2054 | 16#2127	External interrupt service routine 40 does not exist. | External interrupt service routine 251 does not exist.	Stop	Blinking	Keep
16#2128	An action in a sequential function chart (SFC) is incorrectly assigned qualifiers related to time. (SM0/SM1)	Self-defined	Blinking	Keep
16#2129	The modifier R is assigned to an action in a sequential function chart (SFC) incorrectly. (SM0/SM1)	Self-defined	Blinking	Keep
16#212A	MC/MCR instruction cannot be used in interrupt or subroutine. (SM5)	Self-defined	Blinking	Keep
16#6000	Ethernet connection error (SM1106)	Continue	Blinking	Keep
16#6001	Illegal IP address (SM1107)	Continue	Blinking	Keep
16#6002	Illegal netmask address (SM1107)	Continue	Blinking	Keep
16#6003	Illegal gateway mask (SM1107)	Continue	Blinking	Keep
16#6004	The IP address filter is set incorrectly. (SM1108)	Continue	Blinking	Keep
16#6006	The static ARP table is set incorrectly. (SM1108)	Continue	Blinking	Keep
16#6007	The NTP client service is set incorrectly. (SM1380)	Continue	Blinking	Keep
16#6008	Illegal network number (SM1107)	Continue	Blinking	Keep
16#6009	Illegal node number (SM1107)	Continue	Blinking	Keep
16#600A	TCP connection failure (SM1090)	Continue	Keep	Keep
16#600B	UDP connection failure (SM1091)	Continue	Keep	Keep
16#600C	The TCP socket has been used. (SM1109)	Continue	Keep	Keep
16#600D	The RJ45 port is not connected.	Continue	Keep	Keep
16#600E	An RJ45 port on AH10EN-5A is not connected to a network cable.	Continue	Keep	Keep
16#600F	The maximum MODBUS TCP connection is reached. (SM1089)	Continue	Blinking	Keep
16#6010	BOOTP IP is set incorrectly. (SM1107)	Continue	Keep	Keep
16#6011	BOOTP Gateway is set incorrectly. (SM1107)	Continue	Keep	Keep
16#6012	Duplicated IP address (SM1107)	Continue	Blinking	Keep
16#6013	DNS address is set incorrectly. (SM1107)	Continue	Keep	Keep
16#6100	The email connection is busy. (SM1113)	Continue	Keep	Keep
16#6101	The trigger in the email is set incorrectly. (SM1112)	Continue	Blinking	Keep
16#6102	The interval of sending the email is set incorrectly. (SM1112)	Continue	Blinking	Keep
16#6103	The device containing the data specified as the attachment exceeds the device range. (SM1112)	Continue	Blinking	Keep
16#6104	The attachment in the email does not exist. (SM1113)	Continue	Keep	Keep
16#6105	The attachment in the email is oversized. (SM1113)	Continue	Keep	Keep
16#6106	The SMTP server address is incorrect. (SM1112)	Continue	Blinking	Keep
16#6107	There is an SMTP server response timeout. (SM1113)	Continue	Keep	Keep
16#6108	SMTP authentication error (SM1112)	Continue	Blinking	Keep
16#6110	The SMTP server needs to be authenticated. (SM1112)	Continue	Blinking	Keep
16#6111	The specified email address does not exist. (SM1112)	Continue	Blinking	Keep
16#6200	The remote IP address set in the TCP socket function is illegal. (SM1196)	Continue	Blinking	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#6201	The local communication port set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6202	The remote communication port set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6203	The device from which the data is sent in the TCP socket function is illegal.	Continue	Keep	Keep
16#6204	The transmitted data length set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6205	The data which is sent through the TCP socket exceeds the device range.	Continue	Keep	Keep
16#6206	The device which receives the data in the TCP socket function is illegal.	Continue	Keep	Keep
16#6207	The received data length set in the TCP socket function is illegal.	Continue	Keep	Keep
16#6208	The data which is received through the TCP socket exceeds the device range.	Continue	Keep	Keep
16#6209	The remote IP address set in the UDP socket function is illegal. (SM1196)	Continue	Blinking	Keep
16#620A	The local communication port set in the UDP socket function is illegal.	Continue	Keep	Keep
16#620B	The remote communication port set in the UDP socket function is illegal.	Continue	Keep	Keep
16#620C	The device from which the data is sent in the UDP socket function is illegal.	Continue	Keep	Keep
16#620D	The transmitted data length set in the UDP socket function is illegal.	Continue	Keep	Keep
16#620E	The data which is sent through the UDP socket exceeds the device range.	Continue	Keep	Keep
16#620F	The device which receives the data in the UDP socket function is illegal.	Continue	Keep	Keep
16#6210	The received data length set in the UDP socket function is illegal.	Continue	Keep	Keep
16#6211	The data which is received through the UDP socket exceeds the device range.	Continue	Keep	Keep
16#6212	There is no response from the remote device after the timeout period.	Continue	Keep	Keep
16#6213	The data received exceeds the limit.	Continue	Keep	Keep
16#6214	The remote device refuses the connection.	Continue	Keep	Keep
16#6215	The socket is not opened.	Continue	Keep	Keep
16#6217	The socket is opened.	Continue	Keep	Keep
16#6218	The data has been sent through the socket.	Continue	Keep	Keep
16#6219	The data has been received through the socket.	Continue	Keep	Keep
16#621A	The socket is closed.	Continue	Keep	Keep
16#6300	Only auxiliary relays, data registers, and link registers can be used in the Ether Link.	Continue	Blinking	Keep
16#6301	The device used in the Ether Link exceeds the device range.	Continue	Blinking	Keep
16#6302	The length of the data exchanged in the Ether Link exceeds the limit.	Continue	Blinking	Keep
16#6303	The remote device in the Ether Link aborts the connection.	Continue	Keep	Keep
16#6304	The connection in the Ether Link is busy.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#6305	The node used in the communication command is different from the local node.	Continue	Blinking	Keep
16#6309	The remote device in the Ether Link does not respond after the timeout period.	Continue	Keep	Keep
16#630A	The module ID or the setting of the module is different from the setting in the Ether Link.	Continue	Blinking	Keep
16#630B	The setting of the netmask address for the CPU or the module is different from the setting in the Ether Link.	Continue	Blinking	Keep
16#6400	The number of TCP connections reaches the upper limit, or the flag which is related to the sending of the data is not set to ON.	Continue	Keep	Keep
16#6401	The remote device aborts the connection.	Continue	Keep	Keep
16#6402	There is no response from the remote device after the timeout period.	Continue	Keep	Keep
16#6403	The remote IP address used in the applied instruction is illegal.	Continue	Keep	Keep
16#6404	The MODBUS function code not supported is received.	Continue	Keep	Keep
16#6405	The number of data which will be received is not consistent with the actual length of the data.	Continue	Keep	Keep
16#6500	An error occurs when a data exchange function is initialized. (SM699)	Continue	Blinking	OFF
16#6501	A remote device does not respond after a timeout. (SM828-SM955)	Continue	OFF	OFF
16#6502	The packet with which a remote device replies is incorrect. (SM828-SM955)	Continue	OFF	OFF
16#6700	An error occurs when a Modbus TCP data exchange is initialized.	Continue	Keep	Keep
16#6701	Modbus TCP data exchange timeout	Continue	Keep	Keep
16#6702	The data received by means of a Modbus TCP data exchange is incorrect.	Continue	Keep	Keep
16#7002	The CPU module does not support the function.	Continue	Keep	Keep
16#7203	Invalid access code	Continue	Keep	Keep
16#7401	Function code error	Continue	Keep	Keep
16#7402	The size of a packet exceeds the maximum data length.	Continue	Keep	Keep
16#7404	Packet format error	Continue	Keep	Keep
16#7405	The number of bytes is incorrect.	Continue	Keep	Keep
16#7406	Checksum error	Continue	Keep	Keep
16#7407	There are non-ASCII characters in a command.	Continue	Keep	Keep
16#7408	The PLC is running.	Continue	Keep	Keep
16#740A	Data is being written to the memory in the PLC or data fails to be written to the memory in the PLC.	Continue	Keep	Keep
16#740B	The CPU module is being reset, or the values in the laching devices are being cleared.	Continue	Keep	Keep
16#740C	The backplane number in a communication command is incorrect.	Continue	Keep	Keep
16#740D	The slot number in a communication command is incorrect.	Continue	Keep	Keep
16#740E	An error occurs when the the data in the memory in the PLC is cleared.	Continue	Keep	Keep
16#740F	Communication timeout	Continue	Keep	Keep
16#7410	The function code in a reply command is incorrect.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#7412	Owing to the fact that SW1 is ON, data can not be downloaded to the CPU module.	Continue	Keep	Keep
16#757D	The remaining number of PLC password guesses is 0.	Continue	Keep	Keep
16#757E	The PLC password entered is incorrect.	Continue	Keep	Keep
16#8105	The program downloaded to the CPU module is incorrect. The syntax downloaded is incorrect.	Continue	Keep	Keep
16#8106	The program downloaded is incorrect. The length of the machine code exceeds the limit.	Continue	Keep	Keep
16#8107	The program downloaded is incorrect. The length of the source code exceeds the limit.	Continue	Keep	Keep
16#8230	A CPU parameter downloaded is incorrect. The IP address is illegal.	Continue	Keep	Keep
16#8231	A CPU parameter downloaded is incorrect. The netmask address is illegal.	Continue	Keep	Keep
16#8232	A CPU parameter downloaded is incorrect. The gateway address is illegal.	Continue	Keep	Keep
16#8233	A CPU parameter downloaded is incorrect. The IP address filter is set incorrectly.	Continue	Keep	Keep
16#8235	A CPU parameter downloaded is incorrect. The static ARP table is set incorrectly.	Continue	Keep	Keep
16#8236	A CPU parameter downloaded is incorrect. The NTP client service is set incorrectly.	Continue	Keep	Keep
16#8239	A CPU parameter downloaded is incorrect. The email sending function is set incorrectly.	Continue	Keep	Keep
16#823A	A CPU parameter downloaded is incorrect. The condition for the sending of an email is set incorrectly.	Continue	Keep	Keep
16#823B	A CPU parameter downloaded is incorrect. A TCP socket is set incorrectly.	Continue	Keep	Keep
16#823C	A CPU parameter downloaded is incorrect. A UDP socket is set incorrectly.	Continue	Keep	Keep
16#823E	A CPU parameter downloaded is incorrect. The eeb function is set incorrectly.	Continue	Keep	Keep
16#8240	A CPU parameter downloaded is incorrect. The data exchange by means of Ethernet is set incorrectly	Continue	Keep	Keep
16#8241	The setting of a DNS server is incorrect.	Continue	Keep	Keep
16#8522	A module configuration is being scanned.	Continue	Keep	Keep
16#853B	An I/O module is not configured.	Continue	Keep	Keep
16#853C	An I/O module does not exist.	Continue	Keep	Keep
16#854B	An I/O module is not configured.	Continue	Keep	Keep
16#854C	An I/O module does not exist.	Continue	Keep	Keep
16#8572	The checksum of the module configuration table is incorrect.	Continue	Keep	Keep
16#8576	The checksum of the module parameter setting is incorrect.	Continue	Keep	Keep
16#857A	The checksum of the module parameter mapping table is incorrect.	Continue	Keep	Keep
16#85E1	An I/O interrupt number is incorrect.	Continue	Keep	Keep
16#85E2	An I/O interrupt service routine does not exist.	Continue	Keep	Keep
16#860F	System restoration error	Continue	Blinking	Blinking
16#8611	No memory card exists, or the memory card format is incorrect.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#8612	An error occurs when data is accessed from the memory card, or the memory card is in read-only mode.	Continue	Keep	Keep
16#9A01	The setting of the data exchange for slave 1 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A02	The setting of the data exchange for slave 2 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A03	The setting of the data exchange for slave 3 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A04	The setting of the data exchange for slave 4 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A05	The setting of the data exchange for slave 5 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A06	The setting of the data exchange for slave 6 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A07	The setting of the data exchange for slave 7 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A08	The setting of the data exchange for slave 8 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A09	The setting of the data exchange for slave 9 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0A	The setting of the data exchange for slave 10 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0B	The setting of the data exchange for slave 11 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0C	The setting of the data exchange for slave 12 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0D	The setting of the data exchange for slave 13 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0E	The setting of the data exchange for slave 14 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A0F	The setting of the data exchange for slave 15 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A10	The setting of the data exchange for slave 16 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A11	The setting of the data exchange for slave 17 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A12	The setting of the data exchange for slave 18 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A13	The setting of the data exchange for slave 19 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A14	The setting of the data exchange for slave 20 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A15	The setting of the data exchange for slave 21 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A16	The setting of the data exchange for slave 22 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A17	The setting of the data exchange for slave 23 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A18	The setting of the data exchange for slave 24 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A19	The setting of the data exchange for slave 25 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1A	The setting of the data exchange for slave 26 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1B	The setting of the data exchange for slave 27 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1C	The setting of the data exchange for slave 28 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1D	The setting of the data exchange for slave 29 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1E	The setting of the data exchange for slave 30 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A1F	The setting of the data exchange for slave 31 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A20	The setting of the data exchange for slave 32 in the PLC Link / COM1 MODBUS is incorrect. (SM1590)	Continue	Keep	Keep
16#9A21	An error occurs when the master communicates with slave 1 in the PLC Link / COM1 MODBUS. (SM SM1591)	Continue	Keep	Keep
16#9A22	An error occurs when the master communicates with slave 2 in the PLC Link / COM1 MODBUS. (SM SM1591)	Continue	Keep	Keep
16#9A23	An error occurs when the master communicates with slave 3 in the PLC Link / COM1 MODBUS. (SM SM1591)	Continue	Keep	Keep
16#9A24	An error occurs when the master communicates with slave 4 in the PLC Link / COM1 MODBUS. (SM SM1591)	Continue	Keep	Keep
16#9A25	An error occurs when the master communicates with slave 5 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A26	An error occurs when the master communicates with slave 6 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A27	An error occurs when the master communicates with slave 7 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A28	An error occurs when the master communicates with slave 8 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A29	An error occurs when the master communicates with slave 9 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A2A	An error occurs when the master communicates with slave 10 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A2B	An error occurs when the master communicates with slave 11 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A2C	An error occurs when the master communicates with slave 12 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A2D	An error occurs when the master communicates with slave 13 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A2E	An error occurs when the master communicates with slave 14 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A2F	An error occurs when the master communicates with slave 15 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A30	An error occurs when the master communicates with slave 16 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A31	An error occurs when the master communicates with slave 17 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A32	An error occurs when the master communicates with slave 18 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A33	An error occurs when the master communicates with slave 19 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A34	An error occurs when the master communicates with slave 20 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A35	An error occurs when the master communicates with slave 21 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A36	An error occurs when the master communicates with slave 22 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A37	An error occurs when the master communicates with slave 23 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A38	An error occurs when the master communicates with slave 24 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A39	An error occurs when the master communicates with slave 25 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A3A	An error occurs when the master communicates with slave 26 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A3B	An error occurs when the master communicates with slave 27 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A3C	An error occurs when the master communicates with slave 28 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A3D	An error occurs when the master communicates with slave 29 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A3E	An error occurs when the master communicates with slave 30 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A3F	An error occurs when the master communicates with slave 31 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A40	An error occurs when the master communicates with slave 32 in the PLC Link / COM1 MODBUS. (SM1591)	Continue	Keep	Keep
16#9A41	There is no response from slave 1 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A42	There is no response from slave 2 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A43	There is no response from slave 3 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A44	There is no response from slave 4 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A45	There is no response from slave 5 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A46	There is no response from slave 6 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A47	There is no response from slave 7 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A48	There is no response from slave 8 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A49	There is no response from slave 9 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A4A	There is no response from slave 10 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A4B	There is no response from slave 11 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A4C	There is no response from slave 12 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A4D	There is no response from slave 13 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A4E	There is no response from slave 14 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A4F	There is no response from slave 15 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A50	There is no response from slave 16 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A51	There is no response from slave 17 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A52	There is no response from slave 18 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A53	There is no response from slave 19 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A54	There is no response from slave 20 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A55	There is no response from slave 21 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A56	There is no response from slave 22 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A57	There is no response from slave 23 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A58	There is no response from slave 24 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A59	There is no response from slave 25 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A5A	There is no response from slave 26 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A5B	There is no response from slave 27 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A5C	There is no response from slave 28 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A5D	There is no response from slave 29 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A5E	There is no response from slave 30 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A5F	There is no response from slave 31 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A60	There is no response from slave 32 in the PLC Link / COM1 MODBUS. (SM1592)	Continue	Keep	Keep
16#9A61	The setting of the PLC Link / COM1 MODBUS mode is incorrect. (SM1589)	Continue	Keep	Keep
16#9A62	The number of polling cycles in the PLC Link / COM1 MODBUS is incorrect. (SM1592)	Continue	Keep	Keep
16#9A63	There is a handshaking timeout when the CPU module establishes a connection with the network module. (SM1596)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9A64	There is no network module parameter in the CPU module. (SM1596)	Continue	Keep	Keep
16#9B02	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B03	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B04	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B05	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B06	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B07	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B08	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B09	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B0A	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B0B	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B0C	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B0D	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B0E	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B0F	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B11	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B12	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B13	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B14	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B15	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B16	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B17	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B18	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B19	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B1A	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B1B	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B1C	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B1D	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B1E	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B1F	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B20	An error occurs when the COM2 MODBUS connection is initialized.	Continue	Keep	Keep
16#9B21	A communication error occurs, when COM2 is connected to slave 1 by means of MODBUS.	Continue	Keep	Keep
16#9B22	A communication error occurs, when COM2 is connected to slave 2 by means of MODBUS.	Continue	Keep	Keep
16#9B23	A communication error occurs, when COM2 is connected to slave 3 by means of MODBUS.	Continue	Keep	Keep
16#9B24	A communication error occurs, when COM2 is connected to slave 4 by means of MODBUS.	Continue	Keep	Keep
16#9B25	A communication error occurs, when COM2 is connected to slave 5 by means of MODBUS.	Continue	Keep	Keep
16#9B26	A communication error occurs, when COM2 is connected to slave 6 by means of MODBUS.	Continue	Keep	Keep
16#9B27	A communication error occurs, when COM2 is connected to slave 7 by means of MODBUS.	Continue	Keep	Keep
16#9B28	A communication error occurs, when COM2 is connected to slave 8 by means of MODBUS.	Continue	Keep	Keep
16#9B29	A communication error occurs, when COM2 is connected to slave 9 by means of MODBUS.	Continue	Keep	Keep
16#9B2A	A communication error occurs, when COM2 is connected to slave 10 by means of MODBUS.	Continue	Keep	Keep
16#9B2B	A communication error occurs, when COM2 is connected to slave 11 by means of MODBUS.	Continue	Keep	Keep
16#9B2C	A communication error occurs, when COM2 is connected to slave 12 by means of MODBUS.	Continue	Keep	Keep
16#9B2D	A communication error occurs, when COM2 is connected to slave 13 by means of MODBUS.	Continue	Keep	Keep
16#9B2E	A communication error occurs, when COM2 is connected to slave 14 by means of MODBUS.	Continue	Keep	Keep
16#9B2F	A communication error occurs, when COM2 is connected to slave 15 by means of MODBUS.	Continue	Keep	Keep
16#9B30	A communication error occurs, when COM2 is connected to slave 16 by means of MODBUS.	Continue	Keep	Keep
16#9B31	A communication error occurs, when COM2 is connected to slave 17 by means of MODBUS.	Continue	Keep	Keep
16#9B32	A communication error occurs, when COM2 is connected to slave 18 by means of MODBUS.	Continue	Keep	Keep
16#9B33	A communication error occurs, when COM2 is connected to slave 19 by means of MODBUS.	Continue	Keep	Keep
16#9B34	A communication error occurs, when COM2 is connected to slave 20 by means of MODBUS.	Continue	Keep	Keep
16#9B35	A communication error occurs, when COM2 is connected to slave 21 by means of MODBUS.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B36	A communication error occurs, when COM2 is connected to slave 22 by means of MODBUS.	Continue	Keep	Keep
16#9B37	A communication error occurs, when COM2 is connected to slave 23 by means of MODBUS.	Continue	Keep	Keep
16#9B38	A communication error occurs, when COM2 is connected to slave 24 by means of MODBUS.	Continue	Keep	Keep
16#9B39	A communication error occurs, when COM2 is connected to slave 25 by means of MODBUS.	Continue	Keep	Keep
16#9B3A	A communication error occurs, when COM2 is connected to slave 26 by means of MODBUS.	Continue	Keep	Keep
16#9B3B	A communication error occurs, when COM2 is connected to slave 27 by means of MODBUS.	Continue	Keep	Keep
16#9B3C	A communication error occurs, when COM2 is connected to slave 28 by means of MODBUS.	Continue	Keep	Keep
16#9B3D	A communication error occurs, when COM2 is connected to slave 29 by means of MODBUS.	Continue	Keep	Keep
16#9B3E	A communication error occurs, when COM2 is connected to slave 30 by means of MODBUS.	Continue	Keep	Keep
16#9B3F	A communication error occurs, when COM2 is connected to slave 31 by means of MODBUS.	Continue	Keep	Keep
16#9B40	A communication error occurs, when COM2 is connected to slave 32 by means of MODBUS.	Continue	Keep	Keep
16#9B41	There is no response when COM2 is connected to slave 1 by means of MODBUS.	Continue	Keep	Keep
16#9B42	There is no response when COM2 is connected to slave 2 by means of MODBUS.	Continue	Keep	Keep
16#9B43	There is no response when COM2 is connected to slave 3 by means of MODBUS.	Continue	Keep	Keep
16#9B44	There is no response when COM2 is connected to slave 4 by means of MODBUS.	Continue	Keep	Keep
16#9B45	There is no response when COM2 is connected to slave 5 by means of MODBUS.	Continue	Keep	Keep
16#9B46	There is no response when COM2 is connected to slave 6 by means of MODBUS.	Continue	Keep	Keep
16#9B47	There is no response when COM2 is connected to slave 7 by means of MODBUS.	Continue	Keep	Keep
16#9B48	There is no response when COM2 is connected to slave 8 by means of MODBUS.	Continue	Keep	Keep
16#9B49	There is no response when COM2 is connected to slave 9 by means of MODBUS.	Continue	Keep	Keep
16#9B4A	There is no response when COM2 is connected to slave 10 by means of MODBUS.	Continue	Keep	Keep
16#9B4B	There is no response when COM2 is connected to slave 11 by means of MODBUS.	Continue	Keep	Keep
16#9B4C	There is no response when COM2 is connected to slave 12 by means of MODBUS.	Continue	Keep	Keep
16#9B4D	There is no response when COM2 is connected to slave 13 by means of MODBUS.	Continue	Keep	Keep
16#9B4E	There is no response when COM2 is connected to slave 14 by means of MODBUS.	Continue	Keep	Keep
16#9B4F	There is no response when COM2 is connected to slave 15 by means of MODBUS.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#9B50	There is no response when COM2 is connected to slave 16 by means of MODBUS.	Continue	Keep	Keep
16#9B51	There is no response when COM2 is connected to slave 17 by means of MODBUS.	Continue	Keep	Keep
16#9B52	There is no response when COM2 is connected to slave 18 by means of MODBUS.	Continue	Keep	Keep
16#9B53	There is no response when COM2 is connected to slave 19 by means of MODBUS.	Continue	Keep	Keep
16#9B54	There is no response when COM2 is connected to slave 20 by means of MODBUS.	Continue	Keep	Keep
16#9B55	There is no response when COM2 is connected to slave 21 by means of MODBUS.	Continue	Keep	Keep
16#9B56	There is no response when COM2 is connected to slave 22 by means of MODBUS.	Continue	Keep	Keep
16#9B57	There is no response when COM2 is connected to slave 23 by means of MODBUS.	Continue	Keep	Keep
16#9B58	There is no response when COM2 is connected to slave 24 by means of MODBUS.	Continue	Keep	Keep
16#9B59	There is no response when COM2 is connected to slave 25 by means of MODBUS.	Continue	Keep	Keep
16#9B5A	There is no response when COM2 is connected to slave 26 by means of MODBUS.	Continue	Keep	Keep
16#9B5B	There is no response when COM2 is connected to slave 27 by means of MODBUS.	Continue	Keep	Keep
16#9B5C	There is no response when COM2 is connected to slave 28 by means of MODBUS.	Continue	Keep	Keep
16#9B5D	There is no response when COM2 is connected to slave 29 by means of MODBUS.	Continue	Keep	Keep
16#9B5E	There is no response when COM2 is connected to slave 30 by means of MODBUS.	Continue	Keep	Keep
16#9B5F	There is no response when COM2 is connected to slave 31 by means of MODBUS.	Continue	Keep	Keep
16#9B60	There is no response when COM2 is connected to slave 32 by means of MODBUS.	Continue	Keep	Keep
16#B100	I/O Connections Duplicated	Continue	Keep	Keep
16#B106	Ownership Conflict	Continue	Keep	Keep
16#B110	Target for Connection not Configured	Continue	Keep	Keep
16#B111	Adapter RPI Not Supported	Continue	Keep	Keep
16#B113	Out of Connections	Continue	Keep	Keep
16#B119	Non-Listen Only Not Opened	Continue	Keep	Keep
16#B127	Invalid Originator to Target Size	Continue	Keep	Keep
16#B128	Invalid Target to Originator Size	Continue	Keep	Keep
16#B129	The configuration path parameters in the EDS file are mismatched.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#B12D	Consumed Tag does not exist.	Continue	Keep	Keep
16#B12E	Produced Tag does not exist.	Continue	Keep	Keep
16#B203	I/O Connection Timeout	Continue	Keep	Keep
16#B204	Unconnected Request Timeout	Continue	Keep	Keep
16#B302	Network Bandwidth NOT Available for Data	Continue	Keep	Keep
16#B315	Invalid Segment in Connection Path	Continue	Keep	Keep
16#E206	The model number for the control mode CPU and the standby mode CPU are not the same.	Continue	Keep	Keep
16#E207	The firmware version for the control mode CPU and the standby mode CPU are not the same.	Continue	Keep	Keep
16#E208	Ethernet for the control mode CPU and the standby mode CPU are not in the same physical network.	Continue	Keep	Keep
16#E209	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (while checking the validation)	Continue	Keep	Keep
16#E20A	The I/O configurations of the control mode CPU is not the same as the actual I/O configurations of the standby mode CPU. (after the validation is checked)	Continue	Keep	Keep
16#E20B	System error	Continue	Keep	Keep
16#E20C	Synchronization error	Continue	Keep	Keep
16#E20D	Validation failed	Continue	Keep	Keep
16#E20E	I/O bus fault	Continue	Keep	Keep
16#E20F	Heart beat error	Continue	Keep	Keep
16#E210	Heart beat communication timeout	Continue	Keep	Keep
16#E211	Synchronization failed	Continue	Keep	Keep
16#E212	The standby mode CPU is being switched.	Continue	Keep	Keep
16#E213	There is no program on the PLC.	Continue	Keep	Keep
16#E214	PLC program is damage.	Continue	Keep	Keep
16#E215	Scan time out	Continue	Keep	Keep
16#E216	CPU access denied	Continue	Keep	Keep
16#E217	System busy (RST)	Continue	Keep	Keep
16#E218	System busy (CLR)	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E219	Turning on the system	Continue	Keep	Keep
16#E21A	Initialization error	Continue	Keep	Keep
16#E21B	CPU parameters are damage.	Continue	Keep	Keep
16#E21C	Non-latched area error	Continue	Keep	Keep
16#E21D	CPU EIP parameters are damage.	Continue	Keep	Keep
16#E21E	The I/O configuration file does not exist.	Continue	Keep	Keep
16#E21F	The I/O configuration file is damage.	Continue	Keep	Keep
16#E221	PLC program error	Continue	Keep	Keep
16#E230	Ethernet connection error in a redundancy system	Continue	Keep	Keep
16#E260	Module on the main backplane slot 0 does not support a redundancy system.	Continue	Keep	Keep
16#E261	Module on the main backplane slot 1 does not support a redundancy system.	Continue	Keep	Keep
16#E262	Module on the main backplane slot 2 does not support a redundancy system.	Continue	Keep	Keep
16#E263	Module on the main backplane slot 3 does not support a redundancy system.	Continue	Keep	Keep
16#E264	Module on the main backplane slot 4 does not support a redundancy system.	Continue	Keep	Keep
16#E265	Module on the main backplane slot 5 does not support a redundancy system.	Continue	Keep	Keep
16#E266	Module on the main backplane slot 6 does not support a redundancy system.	Continue	Keep	Keep
16#E267	Module on the main backplane slot 7 does not support a redundancy system.	Continue	Keep	Keep
16#E268	Module on the main backplane slot 8 does not support a redundancy system.	Continue	Keep	Keep
16#E269	Module on the main backplane slot 9 does not support a redundancy system.	Continue	Keep	Keep
16#E26A	Module on the main backplane slot 10 does not support a redundancy system.	Continue	Keep	Keep
16#E26B	Module on the main backplane slot 11 does not support a redundancy system.	Continue	Keep	Keep
16#E270	Network module on the main backplane slot 0 does not connect to a network cable.	Continue	Keep	Keep
16#E271	Network module on the main backplane slot 1 does not connect to a network cable.	Continue	Keep	Keep
16#E272	Network module on the main backplane slot 2 does not connect to a network cable.	Continue	Keep	Keep
16#E273	Network module on the main backplane slot 3 does not connect to a network cable.	Continue	Keep	Keep
16#E274	Network module on the main backplane slot 4 does not connect to a network cable.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E275	Network module on the main backplane slot 5 does not connect to a network cable.	Continue	Keep	Keep
16#E276	Network module on the main backplane slot 6 does not connect to a network cable.	Continue	Keep	Keep
16#E277	Network module on the main backplane slot 7 does not connect to a network cable.	Continue	Keep	Keep
16#E278	Network module on the main backplane slot 8 does not connect to a network cable.	Continue	Keep	Keep
16#E279	Network module on the main backplane slot 9 does not connect to a network cable.	Continue	Keep	Keep
16#E27A	Network module on the main backplane slot 10 does not connect to a network cable.	Continue	Keep	Keep
16#E27B	Network module on the main backplane slot 11 does not connect to a network cable.	Continue	Keep	Keep
16#E280	The network module IP of the control mode CPU on the main backplane slot 0 cannot be detected.	Continue	Keep	Keep
16#E281	The network module IP of the control mode CPU on the main backplane slot 1 cannot be detected.	Continue	Keep	Keep
16#E282	The network module IP of the control mode CPU on the main backplane slot 2 cannot be detected.	Continue	Keep	Keep
16#E283	The network module IP of the control mode CPU on the main backplane slot 3 cannot be detected.	Continue	Keep	Keep
16#E284	The network module IP of the control mode CPU on the main backplane slot 4 cannot be detected.	Continue	Keep	Keep
16#E285	The network module IP of the control mode CPU on the main backplane slot 5 cannot be detected.	Continue	Keep	Keep
16#E286	The network module IP of the control mode CPU on the main backplane slot 6 cannot be detected.	Continue	Keep	Keep
16#E287	The network module IP of the control mode CPU on the main backplane slot 7 cannot be detected.	Continue	Keep	Keep
16#E288	The network module IP of the control mode CPU on the main backplane slot 8 cannot be detected.	Continue	Keep	Keep
16#E289	The network module IP of the control mode CPU on the main backplane slot 9 cannot be detected.	Continue	Keep	Keep
16#E28A	The network module IP of the control mode CPU on the main backplane slot 10 cannot be detected.	Continue	Keep	Keep
16#E28B	The network module IP of the control mode CPU on the main backplane slot 11 cannot be detected.	Continue	Keep	Keep
16#E290	The network module heart beat of the control mode CPU on the main backplane slot 0 cannot be detected.	Continue	Keep	Keep
16#E291	The network module heart beat of the control mode CPU on the main backplane slot 1 cannot be detected.	Continue	Keep	Keep
16#E292	The network module heart beat of the control mode CPU on the main backplane slot 2 cannot be detected.	Continue	Keep	Keep
16#E293	The network module heart beat of the control mode CPU on the main backplane slot 3 cannot be detected.	Continue	Keep	Keep
16#E294	The network module heart beat of the control mode CPU on the main backplane slot 4 cannot be detected.	Continue	Keep	Keep
16#E295	The network module heart beat of the control mode CPU on the main backplane slot 5 cannot be detected.	Continue	Keep	Keep
16#E296	The network module heart beat of the control mode CPU on the main backplane slot 6 cannot be detected.	Continue	Keep	Keep

Error code	Description	CPU Status	LED indicator status	
			ERROR	BUS FAULT
16#E297	The network module heart beat of the control mode CPU on the main backplane slot 7 cannot be detected.	Continue	Keep	Keep
16#E298	The network module heart beat of the control mode CPU on the main backplane slot 8 cannot be detected.	Continue	Keep	Keep
16#E299	The network module heart beat of the control mode CPU on the main backplane slot 9 cannot be detected.	Continue	Keep	Keep
16#E29A	The network module heart beat of the control mode CPU on the main backplane slot 10 cannot be detected.	Continue	Keep	Keep
16#E29B	The network module heart beat of the control mode CPU on the main backplane slot 11 cannot be detected.	Continue	Keep	Keep
16#E2A0	The IP detection on the network module installed on the main backplane slot 0 has NOT been executed.	Continue	Keep	Keep
16#E2A1	The IP detection on the network module installed on the main backplane slot 1 has NOT been executed.	Continue	Keep	Keep
16#E2A2	The IP detection on the network module installed on the main backplane slot 2 has NOT been executed.	Continue	Keep	Keep
16#E2A3	The IP detection on the network module installed on the main backplane slot 3 has NOT been executed.	Continue	Keep	Keep
16#E2A4	The IP detection on the network module installed on the main backplane slot 4 has NOT been executed.	Continue	Keep	Keep
16#E2A5	The IP detection on the network module installed on the main backplane slot 5 has NOT been executed.	Continue	Keep	Keep
16#E2A6	The IP detection on the network module installed on the main backplane slot 6 has NOT been executed.	Continue	Keep	Keep
16#E2A7	The IP detection on the network module installed on the main backplane slot 7 has NOT been executed.	Continue	Keep	Keep
16#E2A8	The IP detection on the network module installed on the main backplane slot 8 has NOT been executed.	Continue	Keep	Keep
16#E2A9	The IP detection on the network module installed on the main backplane slot 9 has NOT been executed.	Continue	Keep	Keep
16#E2AA	The IP detection on the network module installed on the main backplane slot 10 has NOT been executed.	Continue	Keep	Keep
16#E2AB	The IP detection on the network module installed on the main backplane slot 11 has NOT been executed.	Continue	Keep	Keep

12.4.2 Analog I/O Modules and Temperature Measurement Modules

Error code	Description	LED indicator status
		CPU BUS FAULT / Module ERROR
16#A000	The signal received by channel 0 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A001	The signal received by channel 1 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A002	The signal received by channel 2 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A003	The signal received by channel 3 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A004	The signal received by channel 4 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A005	The signal received by channel 5 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A006	The signal received by channel 6 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A007	The signal received by channel 7 exceeds the range of inputs which can be received by the hardware.	Blinking
16#A400	The signal received by channel 0 exceeds the range of inputs which can be received by the hardware.	ON
16#A401	The signal received by channel 1 exceeds the range of inputs which can be received by the hardware.	ON
16#A402	The signal received by channel 2 exceeds the range of inputs which can be received by the hardware.	ON
16#A403	The signal received by channel 3 exceeds the range of inputs which can be received by the hardware.	ON
16#A404	The signal received by channel 4 exceeds the range of inputs which can be received by the hardware.	ON
16#A405	The signal received by channel 5 exceeds the range of inputs which can be received by the hardware.	ON
16#A406	The signal received by channel 6 exceeds the range of inputs which can be received by the hardware.	ON
16#A407	The signal received by channel 7 exceeds the range of inputs which can be received by the hardware.	ON
16#A600	Hardware failure	ON
16#A601	The external voltage is abnormal.	ON
16#A602	Internal error The CJC is abnormal.	ON
16#A603	Internal error The factory correction is abnormal.	ON
16#A800	The signal received by channel 0 exceeds the range of inputs which can be received by the hardware.	OFF
16#A801	The signal received by channel 1 exceeds the range of inputs which can be received by the hardware.	OFF
16#A802	The signal received by channel 2 exceeds the range of inputs which can be received by the hardware.	OFF
16#A803	The signal received by channel 3 exceeds the range of inputs which can be received by the hardware.	OFF
16#A804	The signal received by channel 4 exceeds the range of inputs which can be received by the hardware.	OFF
16#A805	The signal received by channel 5 exceeds the range of inputs which can be received by the hardware.	OFF

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A806	The signal received by channel 6 exceeds the range of inputs which can be received by the hardware.	OFF	
16#A807	The signal received by channel 7 exceeds the range of inputs which can be received by the hardware.	OFF	

*With regard to the errors related to the input signals' exceeding the range of inputs which can be received by the hardware and the conversion values' exceeding the limits, whether the error code generated is in the range of 16#A000 to 16#A00F, in the range of 16#A400 to 16#A40F, or in the range of 16#A800 to 16#A80F depends on the LED indicator status defined by users.

12.4.3 AH02HC-5A / AH04HC-5A

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A001	The linear accumulation in channel 0 exceeds the range.	Blinking	
16#A002	The scale set for channel 0 exceeds the range.	Blinking	
16#A003	The number of cycles set for channel 0exceeds the range.	Blinking	
16#A004	The comparison value set for channel 0 exceeds the range.	Blinking	
16#A005	A limit value set for channel 0 is incorrect.	Blinking	
16#A006	The interrupt number set for channel 0 exceeds the range.	Blinking	
16#A011	The linear accumulation in channel 1 exceeds the range.	Blinking	
16#A012	The scale set for channel 1 exceeds the range.	Blinking	
16#A013	The number of cycles set for channel 1 exceeds the range.	Blinking	
16#A014	The comparison value set for channel 1 exceeds the range.	Blinking	
16#A015	A limit value set for channel 1 is incorrect.	Blinking	
16#A016	The interrupt number set for channel 1 exceeds the range.	Blinking	
16#A021	The linear accumulation in channel 2 exceeds the range.	Blinking	
16#A022	The scale set for channel 2 exceeds the range.	Blinking	
16#A023	The number of cycles set for channel 2 exceeds the range.	Blinking	
16#A024	The comparison value set for channel 2 exceeds the range.	Blinking	
16#A025	A limit value set for channel 2 is incorrect.	Blinking	
16#A026	The interrupt number set for channel 2 exceeds the range.	Blinking	
16#A031	The linear accumulation in channel 3 exceeds the range.	Blinking	
16#A032	The scale set for channel 3 exceeds the range.	Blinking	
16#A033	The number of cycles set for channel 3 exceeds the range.	Blinking	
16#A034	The comparison value set for channel 3 exceeds the range.	Blinking	
16#A035	A limit value set for channel 3 is incorrect.	Blinking	
16#A036	The interrupt number set for channel 3 exceeds the range.	Blinking	

12.4.4 AH05PM-5A / AH10PM-5A / AH15PM-5A

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A002	The subroutine has no data.	Blinking	
16#A003	CJ, CJN, and JMP have no matching pointers.	Blinking	
16#A004	There is a subroutine pointer in the main program.	Blinking	
16#A005	Lack of the subroutine	Blinking	
16#A006	The pointer is used repeatedly in the same program.	Blinking	
16#A007	The subroutine pointer is used repeatedly.	Blinking	
16#A008	The pointer used in JMP is used repeatedly in different subroutines.	Blinking	
16#A009	The pointer used in JMP is the same as the pointer used in CALL.	Blinking	
16#A00A	The pointer used in JMP is the same as a subroutine pointer.	Blinking	
16#A00B	Target position (I) of the single speed is incorrect.	Blinking	
16#A00C	Target position (II) of the single-axis motion is incorrect.	Blinking	
16#A00D	The setting of speed (I) of the single-axis motion is incorrect.	Blinking	
16#A00E	The setting of speed (II) of the single-axis motion is incorrect.	Blinking	
16#A00F	The setting of the speed (V_{RT}) of returning to zero is incorrect.	Blinking	
16#A010	The setting of the deceleration (V_{CR}) of returning to zero is incorrect.	Blinking	
16#A011	The setting of the JOG speed is incorrect.	Blinking	
16#A012	The positive pulses generated by the single-axis clockwise motion are inhibited.	Blinking	
16#A013	The negative pulses generated by the single-axis counterclockwise motion are inhibited.	Blinking	
16#A014	The limit switch is reached.	Blinking	
16#A015	The device which is used exceeds the device range.	Blinking	
16#A017	An error occurs when the device is modified by a 16-bit index register/32-bit index register.	Blinking	
16#A018	The conversion into the floating-point number is incorrect.	Blinking	
16#A019	The conversion into the binary-coded decimal number is incorrect.	Blinking	
16#A01A	Incorrect division operation (The divisor is 0.)	Blinking	
16#A01B	General program error	Blinking	
16#A01C	LD/LDI has been used more than nine times.	Blinking	
16#A01D	There is more than one level of nested program structure supported by RPT/RPE.	Blinking	
16#A01E	SRET is used between RPT and RPE.	Blinking	
16#A01F	There is no M102 in the main program, or there is no M2 in the motion program.	Blinking	
16#A020	The wrong instruction is used, or the device used exceeds the range.	Blinking	

12.4.5 AH20MC-5A

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A002	The subroutine has no data.	Blinking	
16#A003	CJ, CJN, and JMP have no matching pointers.	Blinking	
16#A004	There is a subroutine pointer in the main program.	Blinking	
16#A005	Lack of the subroutine	Blinking	
16#A006	The pointer is used repeatedly in the same program.	Blinking	
16#A007	The subroutine pointer is used repeatedly.	Blinking	
16#A008	The pointer used in JMP is used repeatedly in different subroutines.	Blinking	
16#A009	The pointer used in JMP is the same as the pointer used in CALL.	Blinking	
16#A00A	The pointer used in JMP is the same as a subroutine pointer.	Blinking	
16#A00B	Target position (I) of the single speed is incorrect.	Blinking	
16#A00C	Target position (II) of the single-axis motion is incorrect.	Blinking	
16#A00D	The setting of speed (I) of the single-axis motion is incorrect.	Blinking	
16#A00E	The setting of speed (II) of the single-axis motion is incorrect.	Blinking	
16#A00F	The setting of the speed (V_{RT}) of returning to zero is incorrect.	Blinking	
16#A010	The setting of the deceleration (V_{CR}) of returning to zero is incorrect.	Blinking	
16#A011	The setting of the JOG speed is incorrect.	Blinking	
16#A012	The positive pulses generated by the single-axis clockwise motion are inhibited.	Blinking	
16#A013	The negative pulses generated by the single-axis counterclockwise motion are inhibited.	Blinking	
16#A014	The limit switch is reached.	Blinking	
16#A015	The device which is used exceeds the device range.	Blinking	
16#A017	An error occurs when the device is modified by a 16-bit index register/32-bit index register.	Blinking	
16#A018	The conversion into the floating-point number is incorrect.	Blinking	
16#A019	The conversion into the binary-coded decimal number is incorrect.	Blinking	
16#A01A	Incorrect division operation (The divisor is 0.)	Blinking	
16#A01B	General program error	Blinking	
16#A01C	LD/LDI has been used more than nine times.	Blinking	
16#A01D	There is more than one level of nested program structure supported by RPT/RPE.	Blinking	
16#A01E	SRET is used between RPT and RPE.	Blinking	
16#A01F	Incorrect division operation (The divisor is 0.)	Blinking	
16#A020	The wrong instruction is used, or the device used exceeds the range.	Blinking	

12.4.6 AH10EN-5A / AH15EN-5A

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A001	The IP address of host 1 conflicts with another system on the network.	Blinking	
16#A002	The IP address of host 2 conflicts with another system on the network.	Blinking	
16#A003	DHCP for host 1 fails.	Blinking	
16#A004	DHCP for host 2 fails.	Blinking	
16#A401	Hardware error	ON	
16#A402	The initialization of the system fails.	ON	

12.4.7 AH10SCM-5A / AH15SCM-5A

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A002	The setting of the UD Link is incorrect, or the communication fails.	Blinking	
16#A401	Hardware error	ON	
16#A804	The communication through the communication port is incorrect.	OFF	
16#A808	Modbus communication error	OFF	

12.4.8 AH10DNET-5A

Error code	Description	LED indicator status		
		CPU	Module	
		BUS FAULT	MS	NS
16#A0F0	The node ID of AH10DNET-5A is the same as other node ID on the network, or exceeds the range.	The red light blinks.	The green light blinks.	The red light is ON.
16#A0F1	No slave is put in the scan list of AH10DNET-5A.	The red light blinks.	The green light blinks.	The green light is ON.
16#A0F2	The working voltage of AH10DNET-5A is low.	The red light blinks.	The red light blinks.	The red light blinks.
16#A0F3	AH10DNET-5A enters the test mode.	The red light blinks.	The orange light is ON.	The orange light is ON.
16#A0F4	The bus of AH10DNET-5A is switched OFF.	The red light blinks.	The green light is ON.	The red light is ON.
16#A0F5	AH10DNET-5A detects that there is no network power supply to the DeviceNet.	The red light blinks.	The red light blinks.	The red light is ON.
16#A0F6	Something is wrong with the internal memory of AH10DNET-5A.	The red light blinks.	The red light is ON.	The green light blinks.
16#A0F7	Something is wrong with the data exchange unit of AH10DNET-5A.	The red light blinks.	The red light is ON.	The green light blinks.
16#A0F8	The product ID of AH10DNET-5A is incorrect.	The red light blinks.	The red light is ON.	The green light blinks.
16#A0F9	An error occurs when the data is read from AH10DNET-5A, or when the data is written into AH10DNET-5A.	The red light blinks.	The red light is ON.	The red light is ON.
16#A0FA	The node ID of AH10DNET-5A is the same as that of the slave set in the scan list.	The red light blinks.	The green light is ON.	The red light is ON.
16#A0FB	The data exchange between AH10DNET and AH CPU failed.	The red light blinks.	The green light is ON.	The green light is ON.
16#A0FC	Errors occur in the slaves, on the module of an AHRTU-DNET backplane, or on the AHRTU-DNET backplane connection.	The red light blinks.	The red light blinks.	The green light is ON.

12.4.9 AH10PFBM-5A

Error code	Description	LED indicator status			
		CPU	Module		
		BUS FAULT	RUN	SYS	DP
16#A001	The master is not set.	The red light blinks.	The green light is ON.	The green light is ON.	The green light blinks.
16#A003	The master station enters the test mode.	The red light blinks.	The green light is ON.	The green light is ON.	The green light is ON.
16#A005	A timeout occurs when chips inside the master station communicate.	The red light blinks.	The green light is ON.	The green light is ON.	The green light is ON.
16#A00B	A timeout occurs when AH10PFBM-5A exchanges data exchange with a PLC.	The red light blinks.	The green light is ON.	The green light is ON.	The green light is ON.
16#A402	The PLC does not assign the I/O mapping area to the master.	The red light is ON.	The green light is ON.	The green light is ON.	The green light is ON.
16#A404	Master initializing error	The red light is ON.	The green light is ON.	The green light is ON.	The green light is ON.
16#A406	Internal storage unit error	The red light is ON.	The green light is ON.	The green light is ON.	The green light is ON.
16#A407	Data exchange unit error	The red light is ON.	The green light is ON.	The green light is ON.	The green light is ON.
16#A408	Master serial number detection error	The red light is ON.	The green light is ON.	The green light is ON.	The green light is ON.
16#A4E2	The master detects that all the slaves are offline.	The red light is ON.	OFF	The green light is ON.	The red light is ON.
	The master detects that some slaves are offline.	The red light is ON.	OFF	The green light is ON.	The red light blinks.
16#A4E6	The master detects that an error occurs in the module connected to AHRTU-PFBS-5A.	The red light is ON.	The green light is ON.	The green light is ON.	The green light is ON.

12.4.10 AH10PFBS-5A

Error code	Description	LED indicator status		
		CPU	Module	
		BUS FAULT	RUN	NET
16#A4F0	The node address of AH10PFBS-5A exceeds the valid range.	The red light is ON.	The green light is ON.	The green light is ON.
16#A4F1	Internal hardware error	The red light is ON.	The green light is ON.	The green light is ON.
16#A4F2	Parameter error	The red light is ON.	The green light is ON.	The green light is ON.
16#A4F3	Configuration error	The red light is ON.	The green light is ON.	The green light is ON.
16#A4F4	GPIO detection error	The red light is ON.	The green light is ON.	The green light is ON.
16#A4F5	AH10PFBS-5A enters the mode of factory test.	The red light is ON.	The green light is ON.	The green light is ON.
16#A4F6	1. AH10PFBS-5A has not been connected to the PROFIBUS-DP network. 2. PROFIBUS-DP master has not configured AH10PFBS-5A slave or the configured node address of AH10PFBS-5A is inconsistent with that of the actually connected one.	The red light is ON.	The green light is ON.	The red light is ON.

12.4.11 AH10COPM-5A

Error code	Description	LED indicator status	
		CPU	Module
		BUS FAULT	ERROR
16#A0B0	AH10COPM-5A does not send a heartbeat message after a set period of time.	Blinking	The red light flashes twice.
16#A0B1	The length of a PDO that a slave station sends is not the same as the length of the PDO set in the node list.	Blinking	OFF
16#A0B2	The master station selected does not send a node guarding message after a set period of time.	Blinking	The red light flashes twice.
16#A0E0	AH10COPM-5A receives an emergency message from a slave station.	Blinking	OFF
16#A0E1	The length of a PDO that a slave station sends is not the same as the length of the PDO set in the node list.	Blinking	OFF
16#A0E2	AH10COPM-5A does not receive a PDO from a slave station.	Blinking	OFF
16#A0E3	An automatic SDO is not downloaded successfully.	Blinking	OFF
16#A0E4	A PDO parameter is not set successfully.	Blinking	OFF
16#A0E5	A key parameter is set incorrectly.	Blinking	OFF
16#A0E6	The actual network configuration is not the same as the network configuration set.	Blinking	OFF
16#A0E7	The control of the errors in a slave station is not sent after a set period of time.	Blinking	The red light flashes twice.
16#A0E8	The master station address is the same as a slave station address.	Blinking	OFF
16#A0F1	No slave station is added to the node list in CANopen builder.	Blinking	OFF
16#A0F3	An error occurs in AH10COPM-5A.	Blinking	OFF
16#A0F4	The bus used is off.	Blinking	The red light is ON.
16#A0F5	The node address of AH10COPM-5A is set incorrectly.	Blinking	OFF
16#A0F6	Internal error: An error occurs in the manufacturing process in the factory.	Blinking	OFF
16#A0F7	Internal error: GPIO error	Blinking	OFF
16#A0F8	Hardware error	Blinking	OFF
16#A0F9	Low voltage	Blinking	OFF
16#A0FA	An error occurs in the firmware of AH10COPM-5A.	Blinking	OFF
16#A0FB	The transmission registers in AH10COPM-5A are full.	Blinking	OFF
16#A0FC	The reception registers in AH10COPM-5A are full.	Blinking	OFF

Appendix A Installing a USB Driver

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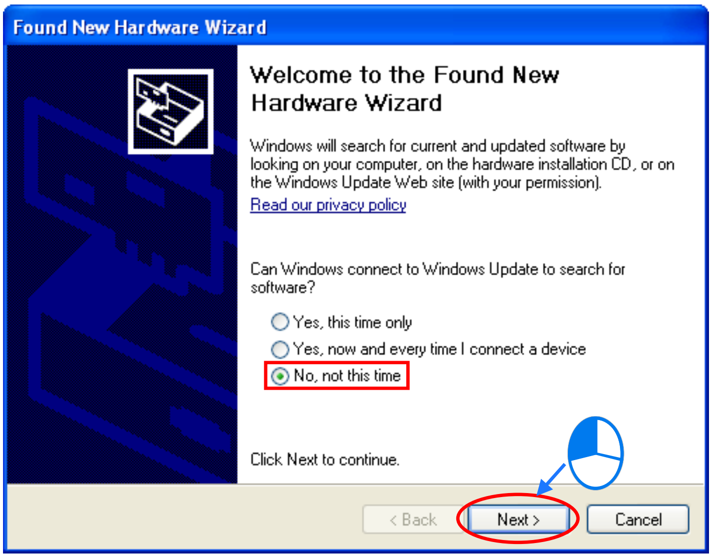
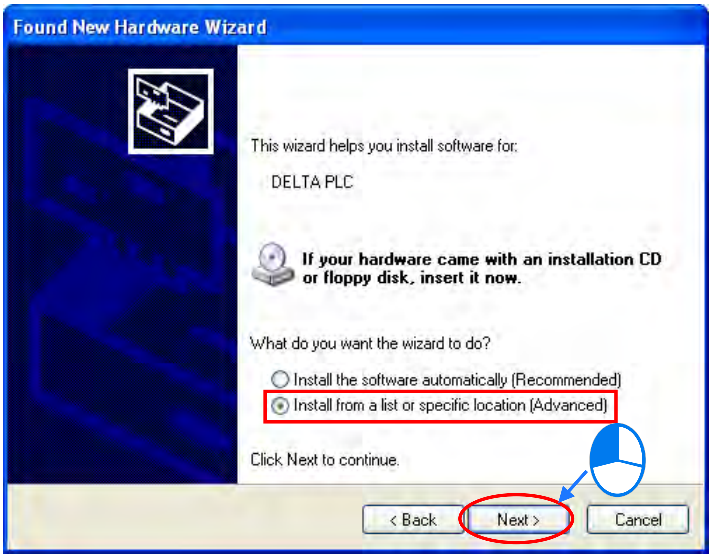
A.1 Installing the USB Driver for an AH500 Series CPU module in Windows XP with SP3

The installation of the USB driver for an AH500 series CPU module on Windows XP is introduced below. If users want to install the USB driver for an AH500 series CPU module on another operating system, they have to refer to the instructions in the operating system for more information about the installation of new hardware.

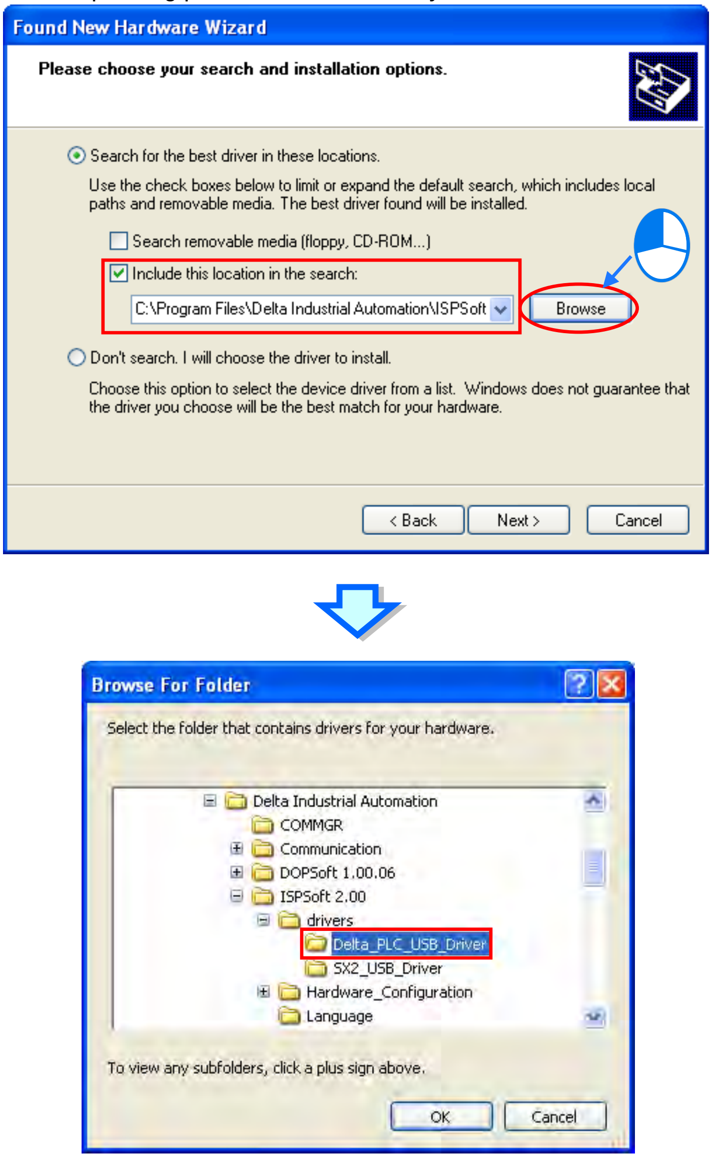
(1) Make sure that the AH500 series CPU module is supplied with power normally. Connect the AH500 series CPU module to a USB port on the computer with a USB cable. Select the **No, not this time** option button in the **Found New Hardware Wizard** window, and then click **Next**.



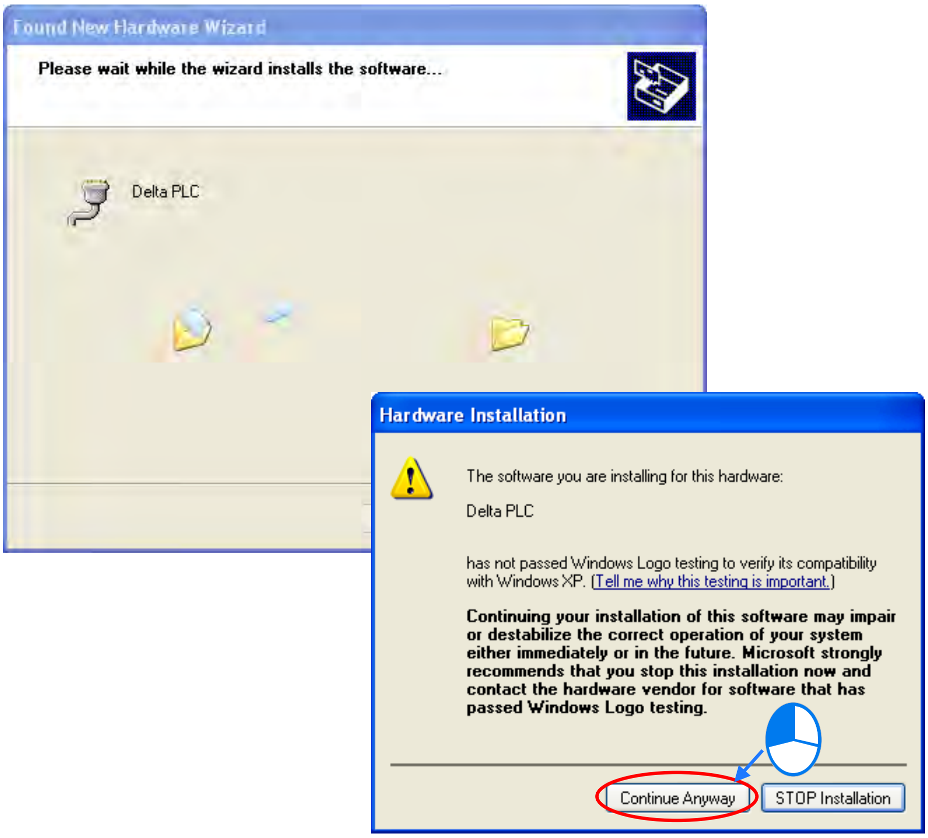
(2) The name of the USB device detected is displayed in the window. Please select the **Install from a lost or specific location (Advanced)** option button.



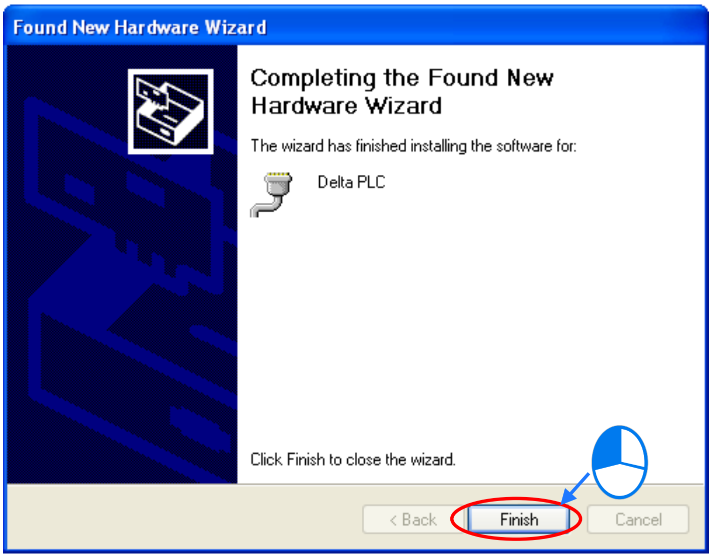
(3) After ISPSoft version 2.00 or above is installed, the driver for the AH500 series CPU module will be in the folder denoted by the path **Installation path of ISPSoft \drivers\Delta_PLC_USB_Driver\.** Specify the correct path. If the driver for the AH500 series CPU module is gotten in another way, users have to specify the corresponding path. Click **Next** to carry on the installation.



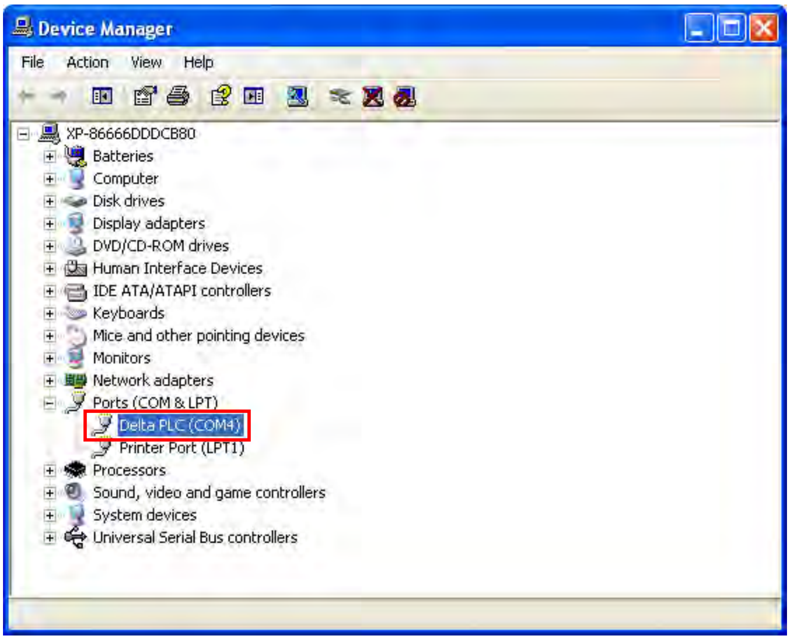
(4) After the correct driver is found in the folder denoted by the path, the system will install the driver. If the **Hardware Installation** window appears during the installation, please click **Continue Anyway**.



(5) Click **Finish** after the installation is finished.



(6) Open the **Device Manager** window after the installation is finished. If the name of the USB device connected is under **Ports (COM&LPT)**, the installation of the driver is successful. The operating system assigns a communication port number to the USB device.



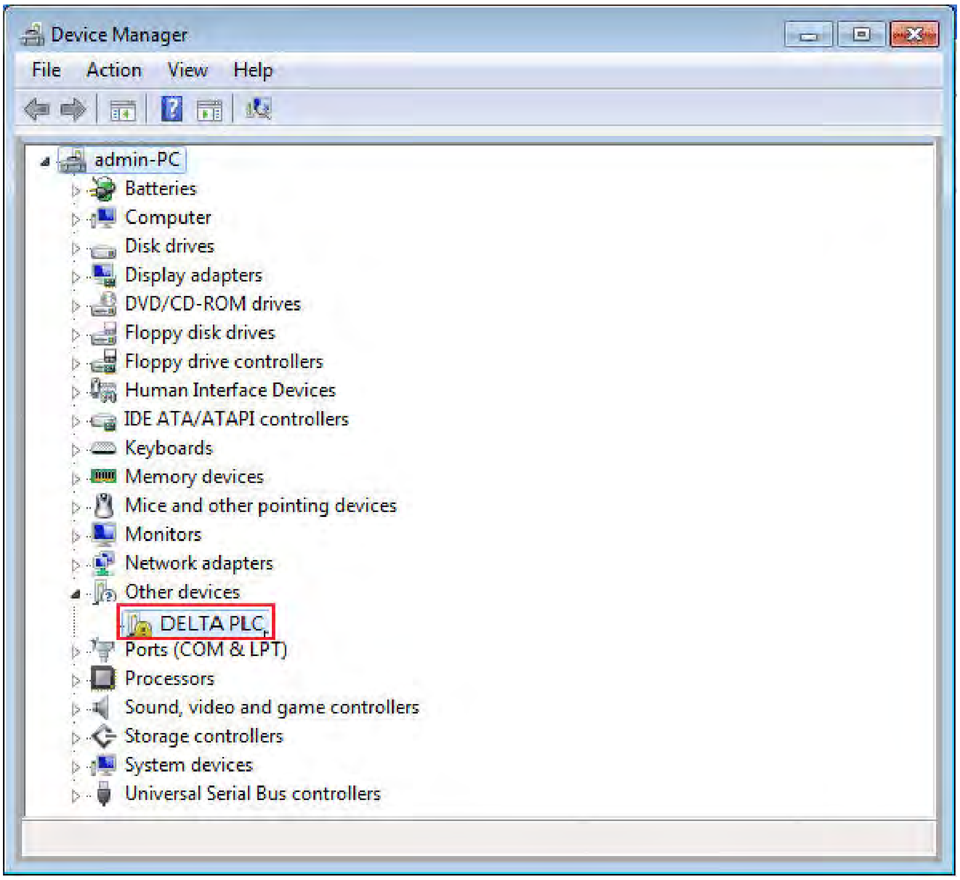
Additional remark

- If the PLC is connected to another USB port on the computer, the system may ask users to install the driver again. The users can follow the steps above, and install the driver again. After the driver is installed, the communication port number that the operating system assigns to the USB device may be different.
- If Windows XP SP3 has not been installed on the computer, an error message will appear during the installation. Users can deal with the problem in either way below.
  (a) Cancel the installation, install Windows XP SP3, and reinstall the driver according to the steps above.
  (b) Get the file needed, and specify the path pointing to the file in the **Files Needed** window.

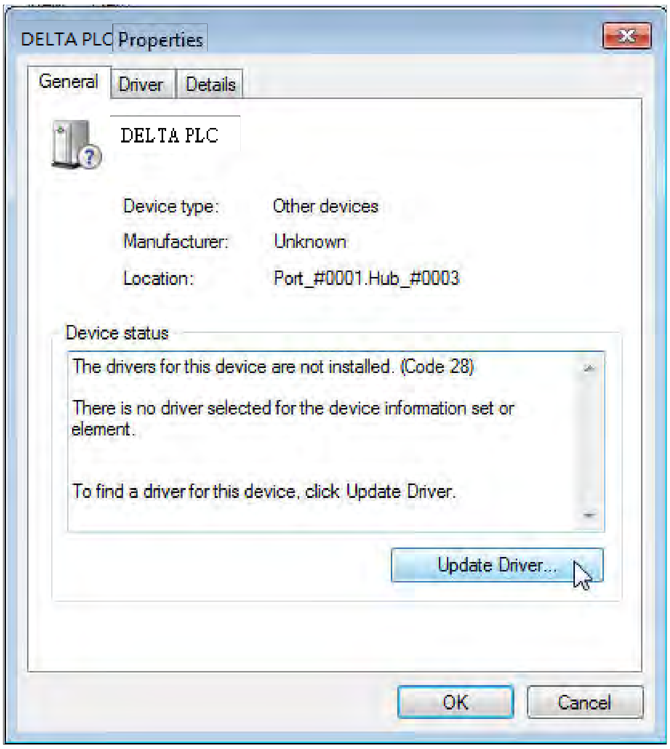
A.2 Installing the USB Driver for an AH500 Series CPU module in Windows 7

The installation of the USB driver for an AH series CPU module on Windows 7 is introduced below. If users want to install the USB driver for an AH series CPU module on another operating system, they have to refer to the instructions in the operating system for more information about the installation of new hardware.

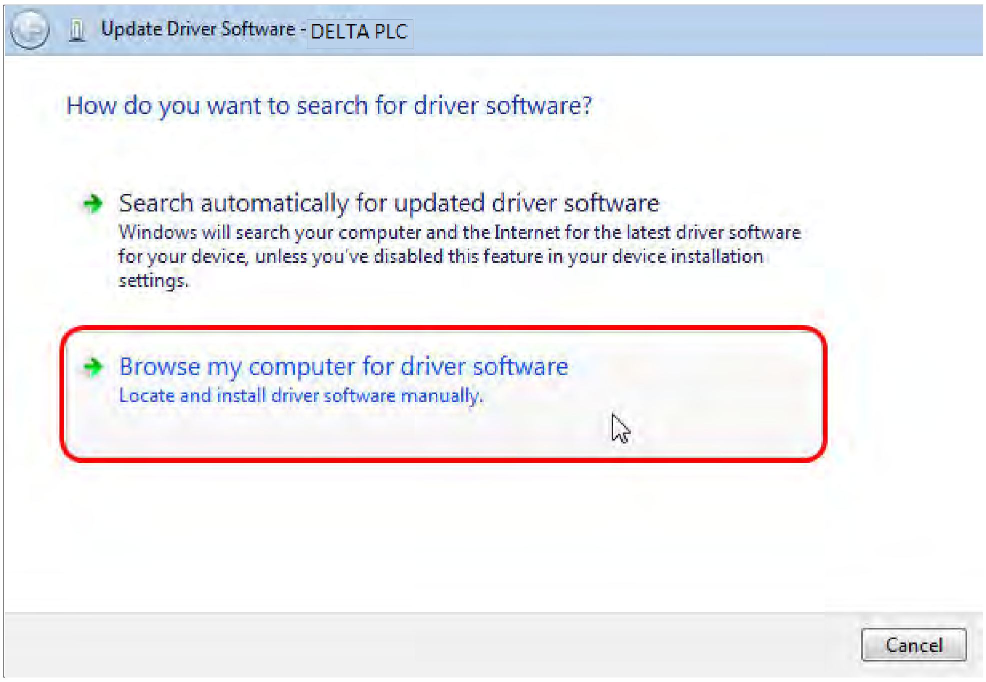
- Make sure that the AH series CPU module is supplied with power normally. Connect the AH series CPU module to a USB port on the computer with a USB cable.
- The name of the USB device detected will be displayed in the Control Panel > Device Manager window. Please select and double-click DELTA PLC.



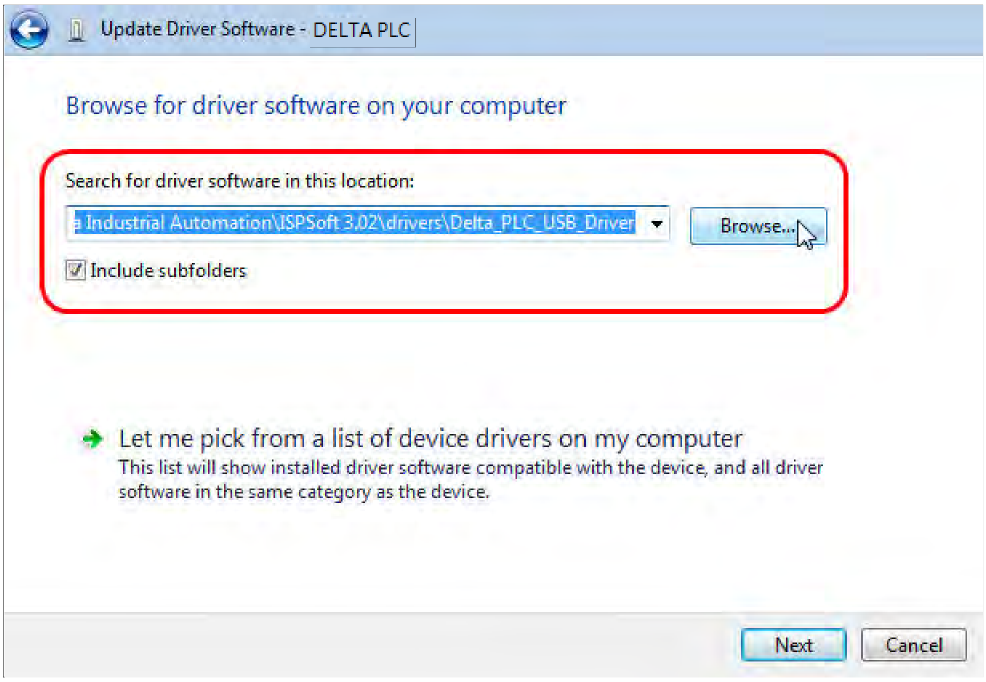
- Click **Update Driver....** in the **DELTA PLC Properties** window.

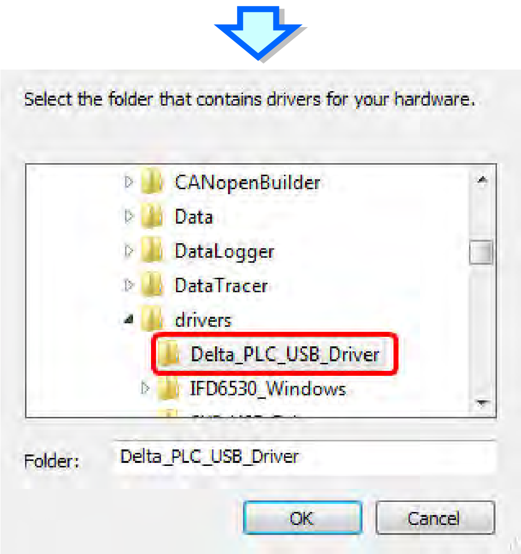


- Click **Browse my computer for driver software**.

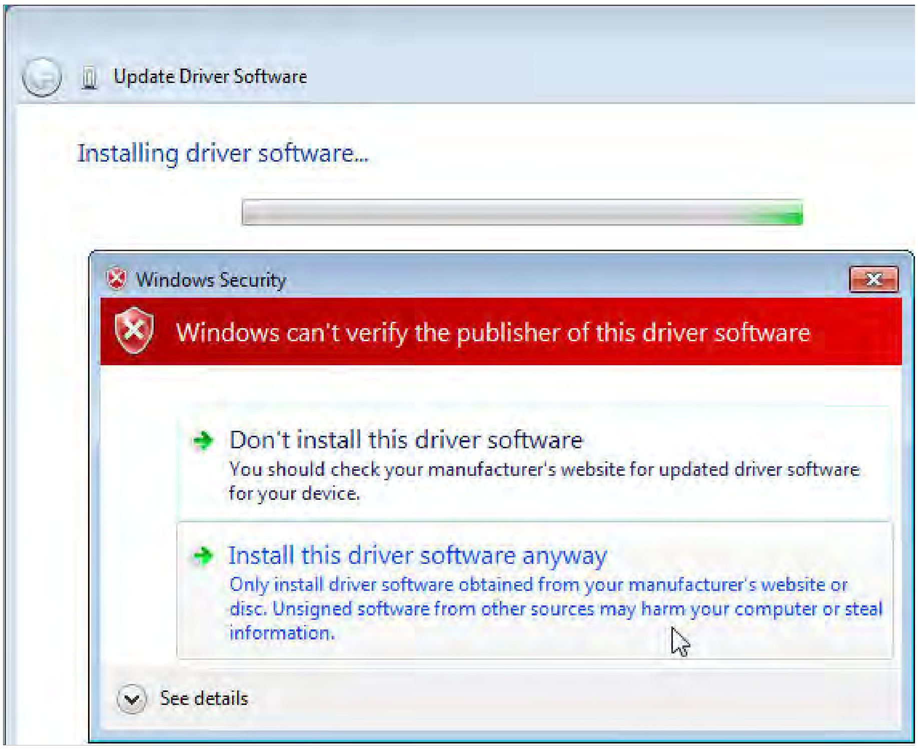


- After ISPSoft version 3.00 or above is installed, the driver for the AH series CPU module will be in the folder denoted by the path Installation path of **ISPSoft \drivers\Delta_PLC_USB_Driver**.
- Specify the correct path. If the driver for the AH series CPU module is gotten in another way, users have to specify the corresponding path. Click **Next** to carry on the installation.

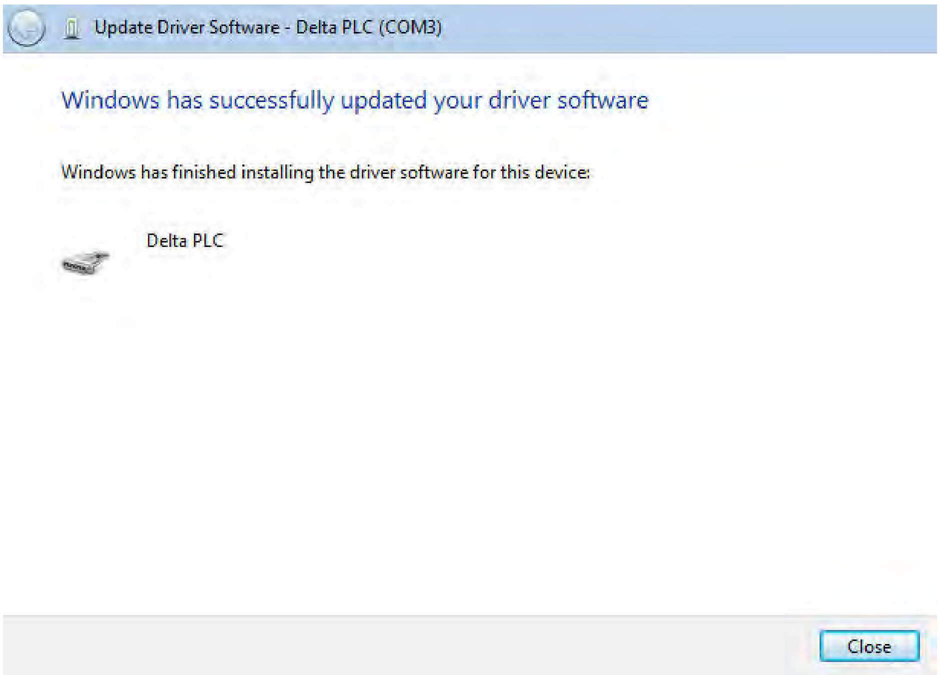

Update Driver Software - DELTA PLC
Browse for driver software on your computer
Search for driver software in this location:
a Industrial Automation\ISPSoft 3.02\drivers\Delta_PLC_USB_Driver
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel


Select the folder that contains drivers for your hardware.
CANopenBuilder
Data
DataLogger
DataTracer
drivers
Delta_PLC_USB_Driver
IFD6530_Windows
Folder:
Delta_PLC_USB_Driver
OK
Cancel

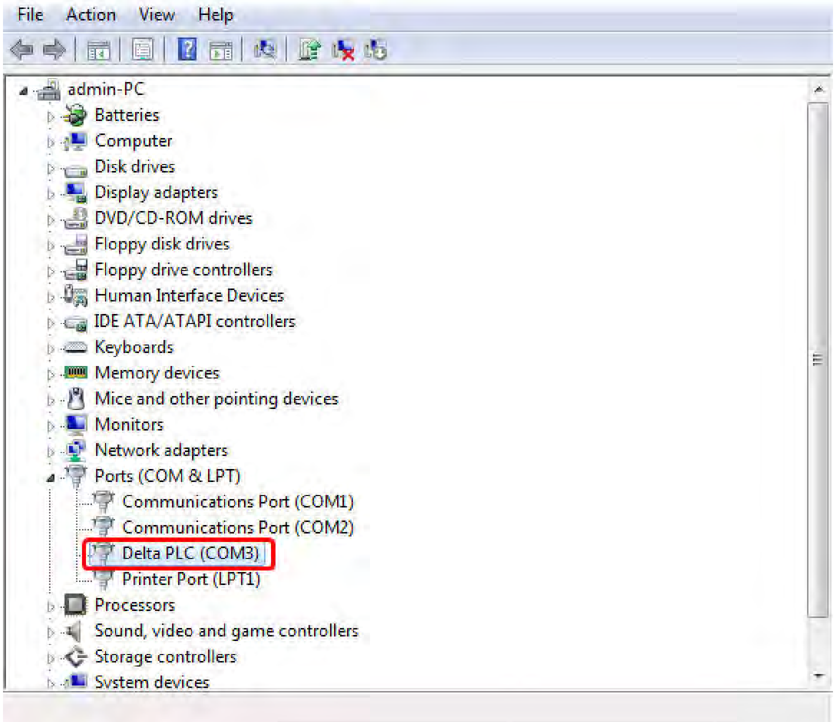
- After the correct driver is found in the folder denoted by the path, the system will install the driver. If the **Windows Security** window appears during the installation, please click **Install this driver software anyway**.



- Click **Close** after the installation is finished.



- Open the **Device Manager** window after the installation is finished. If the name of the USB device connected is under **Ports (COM&LPT)**, the installation of the driver is successful. The operating system assigns a communication port number to the USB device.



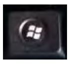
<u>Additional remark</u>

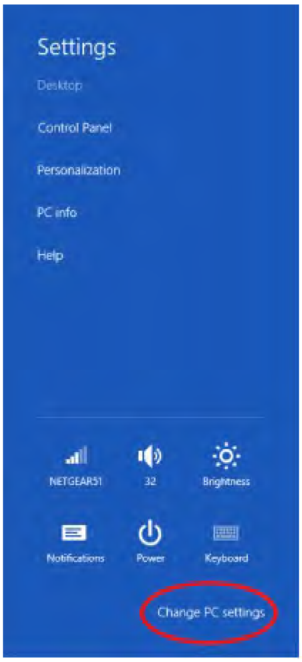
- If the PLC is connected to another USB port on the computer, the system may ask users to install the driver again. The users can follow the steps above, and install the driver again. After the driver is installed, the communication port number that the operating system assigns to the USB device may be different.

A.3 Installing the USB Driver for an AH500 Series CPU module in Windows 8

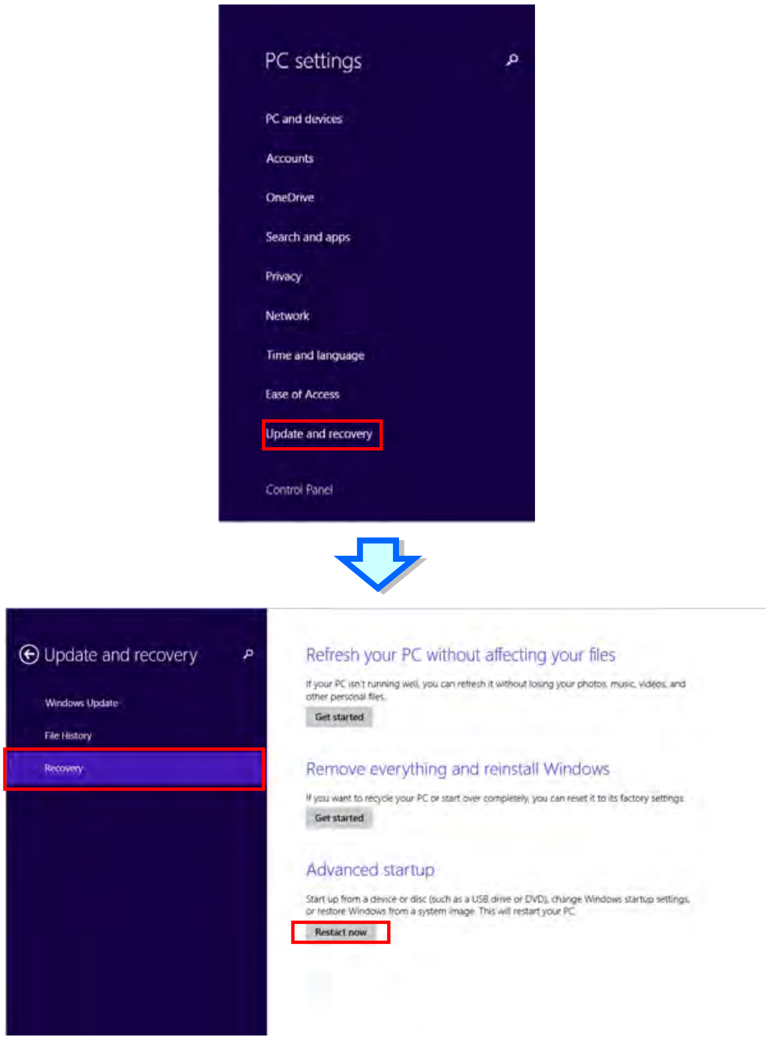
Windows 8 driver signature enforcement provides a way to improve the security of the operating system by validating the integrity of a driver or system file each time it is loaded into memory. However since Delta PLC USB driver does not include the driver signature, this section will help users to disable driver signature enforcement functionality in Windows 8 to ensure a success Delta PLC USB installation. This act is only valid for a single time. The setting will return to its original state after restarting.

Steps to disable driver signature enforcement in Windows 8:

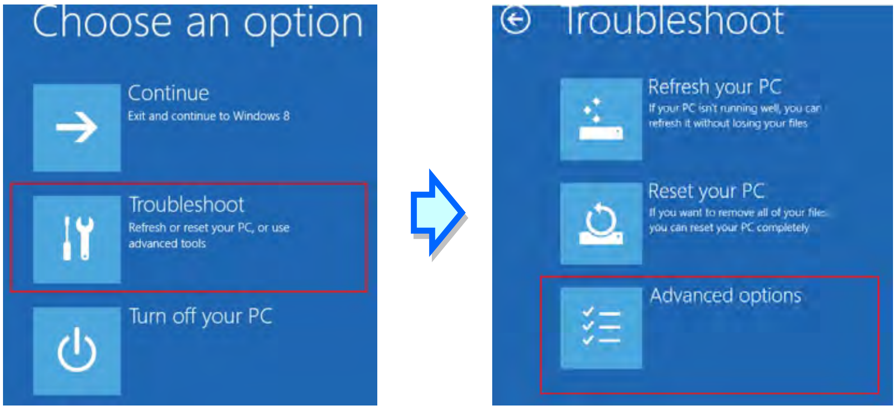
1. Press the button  【WIN】+【I】 on the keyboard to see the Setting interface. Click “Change PC settings”.



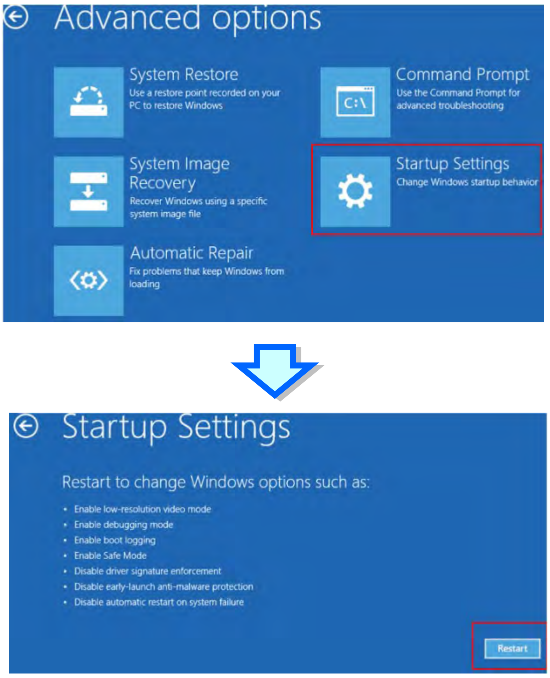
2. The PC settings window will appear. Select “General” and then “Restart now” under “Advanced startup”.



3. After the computer is restarted, select “Troubleshoot”under “Choose an option”. And then select “Advanced options”.



4. From the Advanced options page, select “Startup Settings” to see the Startup Settings. From this page select “Restart” to restart the computer.



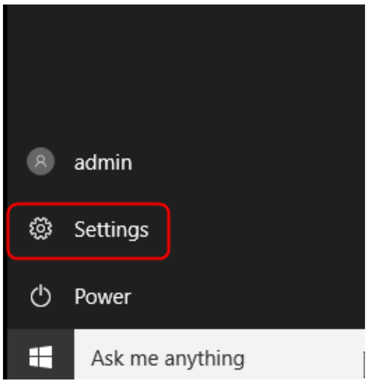
5. Press “7” or “F7” to choose “Disable driver signature enforcement” and the system will direct you to the Windows 8 operating page. Users can then install the Delta PLC USB driver now.
6. For the Delta USB drive installation, please refer to installation in Windows 7 section.

A.4 Installing the USB Driver for an AH500 Series CPU module in Windows 10

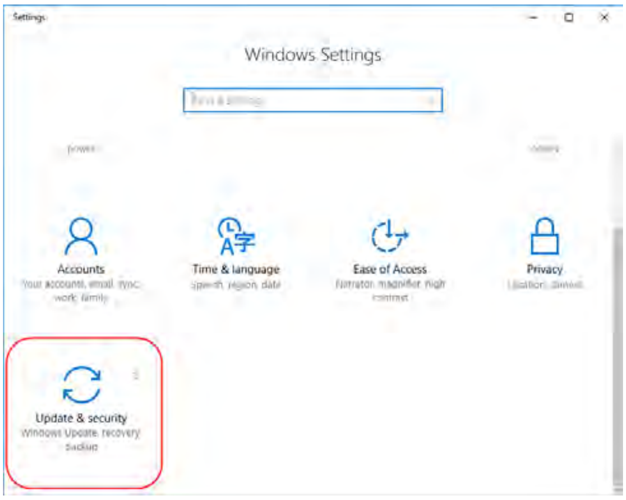
Windows 10 driver signature enforcement provides a way to improve the security of the operating system by validating the integrity of a driver or system file each time it is loaded into memory. However since Delta PLC USB driver does not include the driver signature, this section will help users to disable driver signature enforcement functionality in Windows 10 to ensure a success Delta PLC USB installation. This act is only valid for a single time. The setting will return to its original state after restarting.

Steps to disable driver signature enforcement in Windows 10:

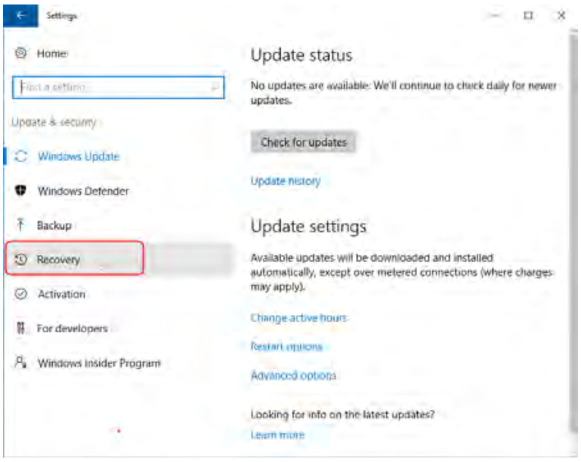
1. Click Start and then Settings.

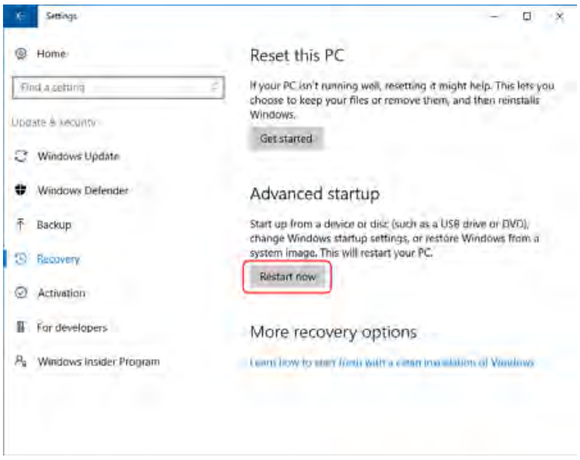


2. Select Update & security

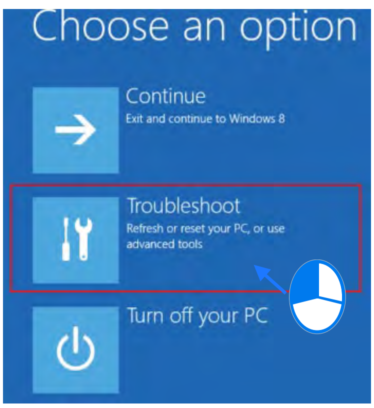


3. Select Recovery and Restart now.

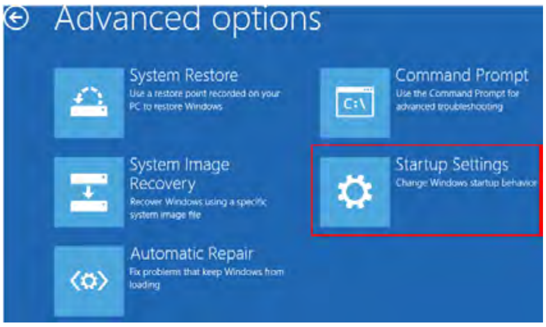


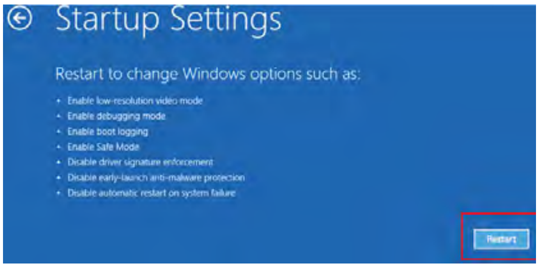


4. After the computer is restarted, select “Troubleshoot” under “Choose an option”. And then select “Advanced options”.

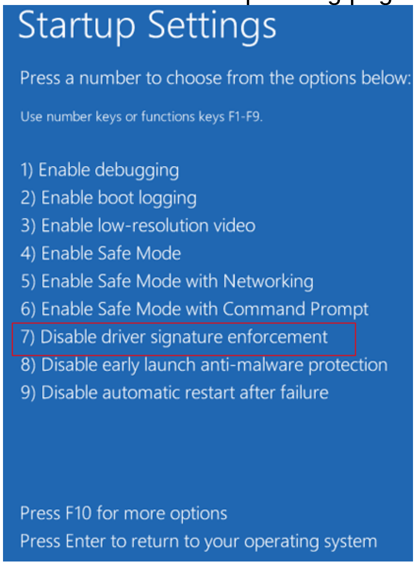


5. From the Advanced options page, select “Startup Settings” to see the Startup Settings. From this page select “Restart” to restart the computer.





6. Press “7” or “F7” to choose “Disable driver signature enforcement” and the system will direct you to the Windows 10 operating page. Users can then install the Delta PLC USB driver now.



7. For the Delta USB drive installation, please refer to installation in Windows 7 section.

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Appendix B Device Addresses

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B.1 Device Addresses

Standard Modbus addresses of devices:

Device	Type	Format	Device range	Modbus address (Decimal number)	AH500 Address (Hexadecimal number)
X	Bit	DDD.D	X0.0~X511.15	124577~132768	6000~7FFF
	Word	DDD	X0~X511	332769~333280	8000~81FF
Y	Bit	DDD.D	Y0.0~Y511.15	040961~049152	A000~BFFF
	Word	DDD	Y0~Y511	440961~441472	A000~A1FF
M	Bit	DDDD	M0~M8191	000001~008192	0000~1FFF
SM	Bit	DDDD	SM0~SM2047	016385~018432	4000~47FF
SR	Word	DDDD	SR0~SR2047	449153~451200	C000~C7FF
D	Word	DDDDD	D0~D32767	400001~432768	0000~7FFF
S	Bit	DDDD	S0~S2047	020481~022528	5000~57FF
T	Bit	DDDD	T0~T2047	057345~059392	E000~E7FF
	Word	DDDD	T0~T2047	457345~459392	E000~E7FF
C	Bit	DDDD	C0~C2047	061441~063488	F000~F7FF
	Word	DDDD	C0~C2047	461441~463488	F000~F7FF
HC	Bit	DD	HC0~HC63	064513~064576	FC00~FC3F
	DWord	DD	HC0~HC63	464513~464576	FC00~FC3F
E	Word	DD	E0~E31	465025~465056	FE00~FE1F

Appendix C EMC Standards

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C.1 EMC Standards for an AH500 System

C.1.1 EMC Standards Applicable to an AH500 System

The EMC standards which are applicable to an AH500 system are listed below.

- **EMI**

Port	Frequency range	Level (Normative)	Reference standard
Enclosure port (radiated) (measured at a distance of 10 meters)	30-230 MHz	40 dB (μV/m) quasi-peak	IEC 61000-6-4
	230-1000 MHz	47 dB (μV/m) quasi-peak	
AC power port (conducted)	0.15-0.5 MHz	79 dB (μV) quasi-peak	IEC 61000-6-4
		66 dB (μV) average	
	0.5-30 MHz	73 dB (μV) quasi-peak	
		60 dB (μV) average	

- **EMS**

Environmental phenomenon	Reference standard	Test		Test level
Electrostatic discharge	IEC 61000-4-2	Contact		± 4 kV
		Air		± 8 kV
Radio frequency electromagnetic field Amplitude modulated	IEC 61000-4-3	80% AM, 1 kHz sinusoidal	2.0-2.7 GHz	1 V/m
			1.4-2.0 GHz	3 V/m
			80-1000 MHz	10 V/m
Power frequency magnetic field	IEC 61000-4-8	60 Hz		30 A/m
		50 Hz		30 A/m

- **Conducted immunity test**

Environmental phenomenon		Fast transient burst	High energy surge	Radio frequency interference
Reference standard		IEC 61000-4-4	IEC 61000-4-5	IEC 61000-4-6
Interface/Port	Specific interface/port	Test level	Test level	Test level
Data communication	Shielded cable	1 kV	1 kV CM	10V
	Unshielded cable	1 kV	1 kV CM	10V
Digital and analog I/O	AC I/O (unshielded)	2 kV	2 kV CM 1 kV DM	10V
	Analog or DC I/O(unshielded)	1 kV	1 kV CM	10V
	All shielded lines (to the earth)	1 kV	1 kV CM	10V
Equipment power	AC power	2 kV	2 kV CM 1 kV DM	10V
	DC power	2 kV	0.5 kV CM 0.5 kV DM	10V
I/O power and auxiliary power output	AC I/O and AC auxiliary power	2 kV	2 kV CM 1 kV DM	10V
	DC I/O and DC auxiliary power	2 kV	0.5 kV CM 0.5 kV DM	10V

C.1.2 Installation Instructions for the EMC Standards

A PLC must be installed in a control box. The control box protects the PLC, and shields off the electromagnetic interference generated by the PLC.

(1) Control box
- Use a conductive control box.
- To ensure that an inner plate contacts the control box well, users have to mask the paint on the bolts of the plate.
- To ensure that the control box is grounded well even if there is high-frequency noise, users have to connect the control box with a thick wire.
- The diameter of a hole in the control box must be less than 10 millimeters, i.e. 3.94 inches. If the diameter of the hole is larger than 10 millimeters, the radio frequency noise may be emitted.
- To prevent the radio waves from leaking through the interval between the door of the control box and the PLC, the interval needs to be reduced. Besides, users can prevent the radio waves from leaking by putting an EMI gasket on the painted surface.

(2) Connecting a power cable and a ground

The power cable of the PLC system and the ground are connected in a way described below.
- Provide a ground point near the power supply module. Use thick and short wires to connect the terminals LG and FG with the ground. (The length of the wire should be less than 30 centimeters, i.e. 11.18 inches.) LG and FG function to pass the noise generated by the PLC system to the ground. Therefore, the impedance should be as low as possible. Besides, the wires are used to relieve the noise. They themselves carry a lot of noise. Using the short wires can prevent the wires from acting as antennas.
- Twist the ground and the power cable. After the ground and the power cable are twisted, the noise flowing through the power cable is passed to the ground. If a filter is installed on the power cable, the ground and the power cable do not need to be twisted.

C.1.3 Cables

Grounding a shielded cable

Cables drawn from the control box carry high-frequency noise. When they are outside the control box, they are like antennas emitting noise. To prevent the emission of noise, the cables connected to digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules should be shielded cables.

The use of shielded cables also increases the resistance to noise. If the signal cables connected to digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules are shielded cables, and are grounded properly, the resistance to noise is improved. However, the resistance to noise will not meet the specified requirement if users do not use shielded cables or the shielded cables are not grounded correctly. If the shield of a cable is connected with the control box, users have to make sure that the shield contacts the control box. If the control box is painted, users have to scrape the paint. All fastening must be metal, and the shield must contact the surface of the control box. If the surface is not even, users need to use washers to correct the unevenness, or use an abrasive to level the surface.

If the shield of a shielded cable is grounded, it needs to be as close to a module as possible. Users have to make sure that there is no electromagnetic induction between the cable which is grounded and other cable which is grounded. Besides, users have to take appropriate measures so that the shield of a cable contacts the control box.

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Appendix D Maintenance and Inspection

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D.1 Cautions

Before users undertake the maintenance and the inspection, they have to pay attention to the following items. **The incorrect or careless operation will lead to damage to the staff and the equipment.**

- To prevent a breakdown of an AH500 system or a fire accident, please make sure that the ambient environment is not exposed to corrosive substances such as chloride gas and sulfide gas, flammable substances such as oil mist and cutting powder, or dirt.
- To prevent the connectors from oxidizing, or to prevent the staff from getting an electric shock, please do not touch the connectors.
- To prevent the staff from getting an electric shock, please turn off the power before pulling the connectors or loosening the screws.
- To prevent the cables from being damaged, or to prevent the connectors from being loosened, please do not impose weight on the cable, or pull them violently.
- Please make sure that the input voltage is within the rated range.
- Please do not disassemble or alter the modules. Otherwise, the products will break down, a fire accident will occur, or the staff will be injured.
- To prevent a controlled element from malfunctioning, please make sure that the program and the parameters are written into a new CPU module which replaces an old one before restarting the AH500 system.
- To prevent the improper operation which results in the incorrect output or the damage to the equipment, please refer to the related manuals for more information about operating the modules.
- To prevent the damage to the modules, please touch metal which is grounded or wear an antistatic wrist strap to release the static electricity from the body.
- To prevent the noise from resulting in the breakdown of the system, please keep a proper distance from the system when using a cell phone or a communication apparatus.
- Please avoid installing an AH500 system under the sun or in a humid environment.
- To prevent the temperature of an element from being high, please make sure that the AH500 system keeps a proper distance from heat sources such as coils, heating apparatuses, and resistors.
- To protect an AH500 system, please install an emergency stop switch and an overcurrent protection according to the actual needs.
- Inserting and pulling a module several times may lead to the loose contact between the module and the backplane.
- To prevent an unexpected shock from resulting in the damage to an AH500 system and a controlled element, please make sure that the modules are installed firmly.
- Do not supply power to AH500 Series CPU modules. Via a shared backplane, they are powered by a connected power module that comply with the Safety Extra Low Voltage (SELV) requirements.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

D.2 Daily Maintenance

To keep an AH500 system operating normally, please make sure that the ambient environment and the AH500 system conform to the cautions listed in section 8.1. Users then can undertake the daily inspection described below. If any abnormal situation occurs, please follow the remedy and carry out the maintenance.

D.2.1 Tools Required for Inspection

- A screwdriver
- Industrial alcohol
- A clean cotton cloth

D.2.2 Daily Inspection

No.	Item		Inspection	Criterion	Remedy
1	Appearance		Check visually.	Dirt must not be present.	Remove the dirt.
2	Installation of a backplane		Check whether the set screws are loose.	The backplane must be installed firmly.	Further tighten the screws.
			Check whether the backplane is installed on the DIN rail properly.		Install the backplane on the DIN rail properly.
3	Installation of a module		Check whether the module is loose, the projection is inserted into the hole on the backplane, and the screw is tightened.	The projection under the module must be inserted into the hole in the backplane, and the screw must be tightened.	Install the module firmly.
4	Connection		Check whether the removable terminal block is loose.	The removable terminal block must not be loose.	Install the terminal block firmly.
			Check whether the connector is loose.	The connector must not be loose.	Further tighten the screws on the connector.
5	Power supply module	POWER LED indicator	Check whether the POWER LED indicator is ON.	The POWER LED indicator must be ON.	Please refer to chapter 12 for more information about the troubleshooting.
	CPU module	RUN LED indicator	When the CPU module is running, check whether the RUN LED is ON.	The RUN LED indicator must be ON.	
		ERROR LED indicator	Check whether the ERROR LED indicator is OFF.	The ERROR LED indicator must be OFF.	
		BUS FAULT LED indicator	Check whether the BUS FAULT LED indicator is OFF.	The BUS FAULT LED indicator must be OFF.	
		SYSTEM LED indicator	Check whether the SYSTEM LED indicator is OFF.	The SYSTEM LED indicator must be OFF.	
	LED indicators on an extension module		Check whether the LED indicators on the extension module are ON.	If the LED indicators are ON, the module operates normally.	

* Please refer to Module Manual for more information related to the LED indicators on the extension modules.

D.3 Periodic Maintenance

Under the condition that the daily inspection is undertaken, users are suggested that they should carry out the periodic maintenance according to the actual operating environment. After making sure that the ambient environment and the AH500 system conform to the cautions listed in section D.1, users then can undertake the periodic inspection described below. If any abnormal situation occurs, please follow the remedy and carry out the maintenance.

D.3.1 Tools Required for Inspection

- A screwdriver
- Industrial alcohol
- A clean cotton cloth
- A multimeter
- A thermometer
- A hygrometer

D.3.2 Periodic Inspection

No.	Item		Inspection	Criterion	Remedy
1	Ambient environment	Ambient temperature/ humidity	The ambient temperature and the ambient humidity are measured by a thermometer and a hygrometer.	The ambient temperature and the ambient humidity must conform to the specifications for the modules or the backplane. If the specifications are different, the strictest specifications have high priority.	To ensure that the system operates in a stable environment, check the reason why the environment varies, and eliminate it.
		Atmosphere	Measure corrosive gas.	Corrosive gas must not be present.	
2	Supply voltage		Measure the AC power supply.	The power supply should meet the specifications for the power supply module.	Check the power supply.
3	Installation	Looseness	Check whether the module is loose.	The module must be installed firmly.	Please refer to chapter 4 for more information about installing the module.
		Adhesion of dirt	Check the appearance.	Dirt must not be present.	Remove the dirt.
4	Connection	Looseness of terminal screws	Tighten the screws with a screwdriver.	The screws must not be loose.	Further tighten the screws.
		Looseness of connectors	Pull the connectors.	The connectors must not be loose.	Further tighten the screws on the connectors.
5	PLC system diagnosis		Check the error logs.	No new error occurs.	Please refer to section 12.1.3 for more information.
6	Maximum scan time		Check the state of SR413 and that of SR414 through the device monitoring table in ISPSoft.	The maximum scan cycle must be within the range specified in the system specifications.	Check the reason why the scan time lengthens.

Chapter 3 Installing Software

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Before developing an AH500 Series system, install ISPSoft and COMMGR. ISPSoft is a software platform for integrating the hardware, network configuration, and program development for a system. COMMGR functions as middleware between a computer and devices. It functions as a communication management interface between ISPSoft and AH500 Series hardware.

3.1 Installing and Uninstalling ISPSoft

- System requirements

<table>
<tr><th>Item</th><th colspan="2">System requirement</th></tr>
<tr><td>Operating system</td><td colspan="2">Windows XP / 7 / 8 / 10</td></tr>
<tr><td>CPU</td><td colspan="2">Pentium 1.5 G or above</td></tr>
<tr><td>Memory</td><td colspan="2">256 MB or above (512 MB or above is recommended.)</td></tr>
<tr><td>Hard disk drive</td><td colspan="2">Capacity : 500 MB or above</td></tr>
<tr><td>CD-ROM drive</td><td colspan="2">This is optional for installing ISPSoft.</td></tr>
<tr><td>Monitor</td><td colspan="2">Resolution: 800×600 or above
(suggested setting: 1024x768/96 dpi)</td></tr>
<tr><td>Keyboard/Mouse</td><td colspan="2">A general keyboard/mouse or devices compatible with Windows</td></tr>
<tr><td>Printer</td><td colspan="2">A printer with a driver for Windows. This is needed to print projects.</td></tr>
<tr><td>RS-232 port</td><td>For connecting to a PLC</td><td rowspan="3">One of them is used, but a PLC that is connected must have a corresponding port. (*1)</td></tr>
<tr><td>USB port</td><td>For connecting to a PLC</td></tr>
<tr><td>Ethernet port</td><td>For connecting to a PLC</td></tr>
<tr><td>Communication software</td><td colspan="2">COMMGR, a communication manager, must be installed. (*2)</td></tr>
<tr><td>Supported Models</td><td colspan="2">AH500 series PLCs/DVP series PLCs (exclusive of DVP-PM series PLCs)/ AS series, AC motor drives: VFD with PLC built-in series, and Text panel HMI with PLC built-in series.</td></tr>
</table>

*1. ISPSoft supports several ways to connect a computer to a PLC. Make sure the port and the mode supported by the PLC are correct before you connect a computer to the PLC.

*2. Please refer to section 3.2 for more information about COMMGR.

*3. The functions and specifications mentioned above are only applicable to ISPSoft version 3.00 or above. The older versions are not equipped with complete functions.

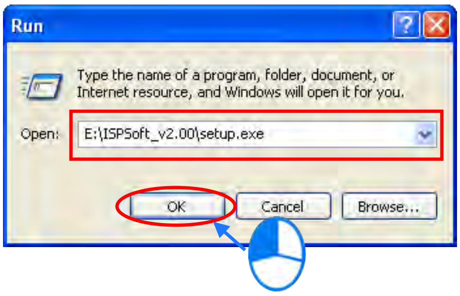
3.1.1 Installing ISPSoft

If an older version of ISPSoft has been installed on a computer, uninstall it before you install ISPSoft. Refer to section 3.1.2 for more information about uninstalling ISPSoft. The following are the steps to install ISPSoft.

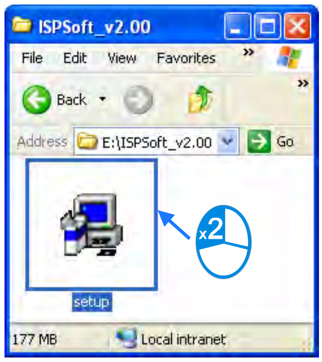
(1) Start the Windows operating system and then install ISPSoft. You may need administrative privileges to install the software.

(2) Put the ISPSoft CD in the CD-ROM drive, or download the installation program from the official Delta website http://www.delta.com. Before you install the installation program downloaded from the website, you must decompress the file.

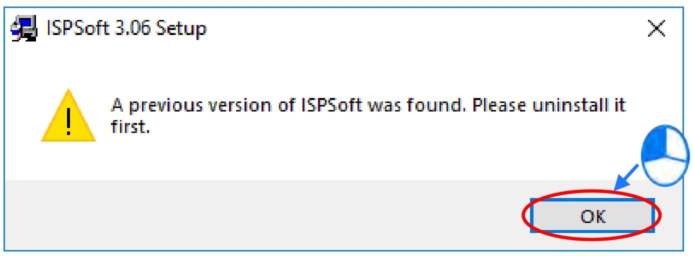
(3) Click **Start**, and then click **Run…** to open the **Run** window. Specify the path to the file called setup.exe in the **Open** box, and then click **OK**. You can also double-click the **setup** icon to execute the installation program.

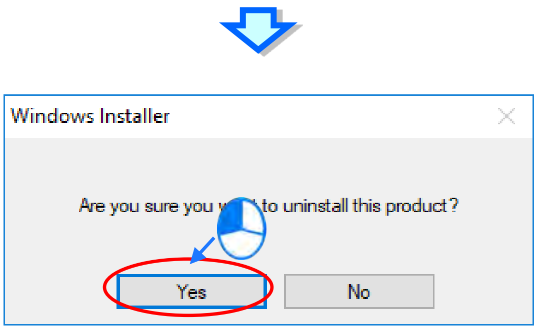


OR

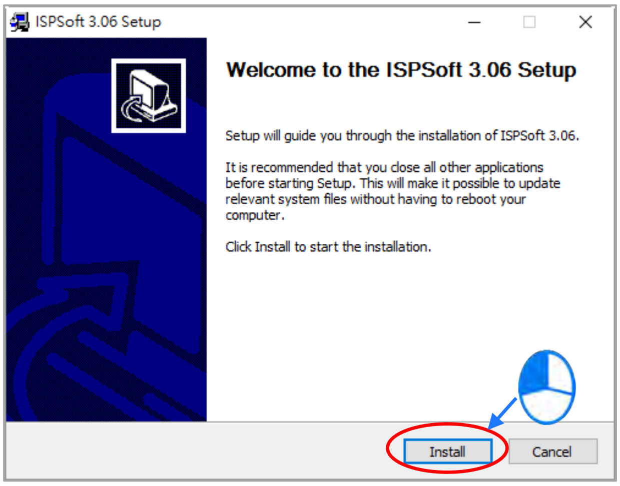


(4) When a previous version of the ISPSoft is found, click **OK** then **Yes t**o uninstall that version shown in the pop-up windows (see below).

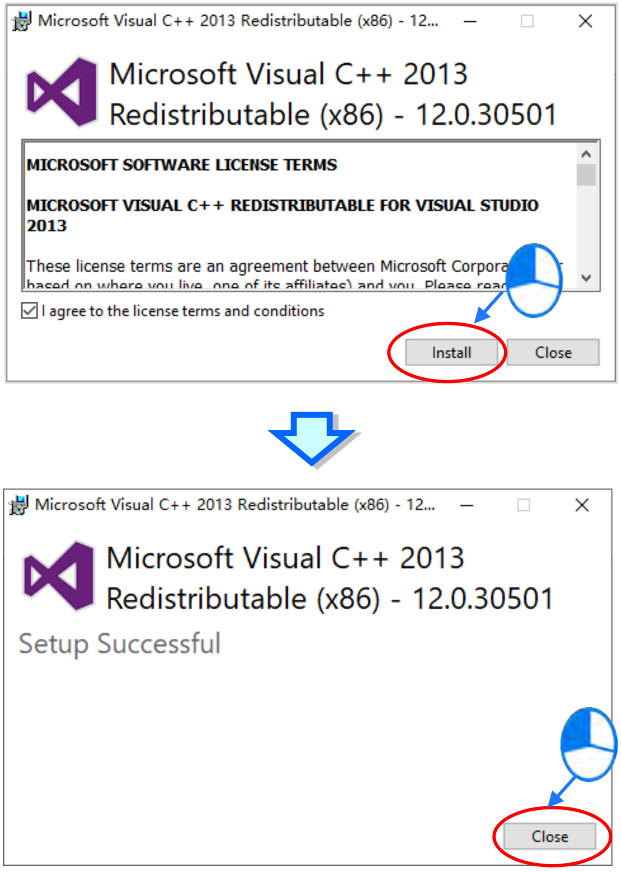




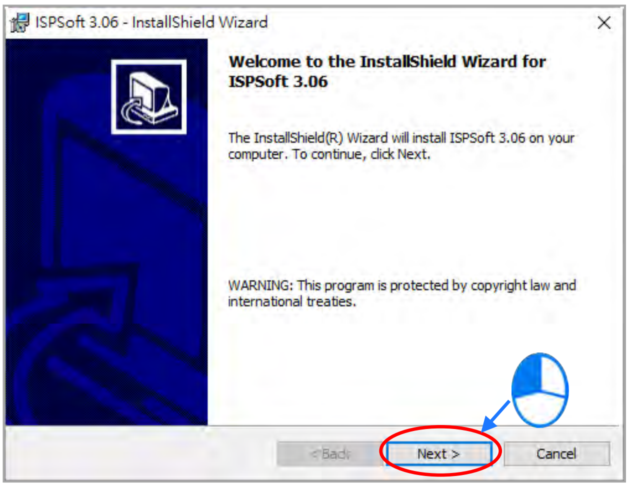
(5) Click **Install** once Shield Wizard window appears.



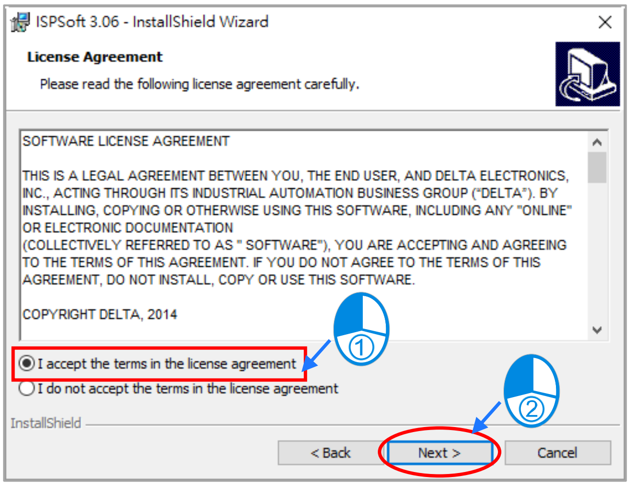
(6) The installation program detects if your computer has installed Microsoft Visual C++ 2013 or not. If not, the following installation steps will show up. Click **Install** to install and after the installation is done, click **Close**.



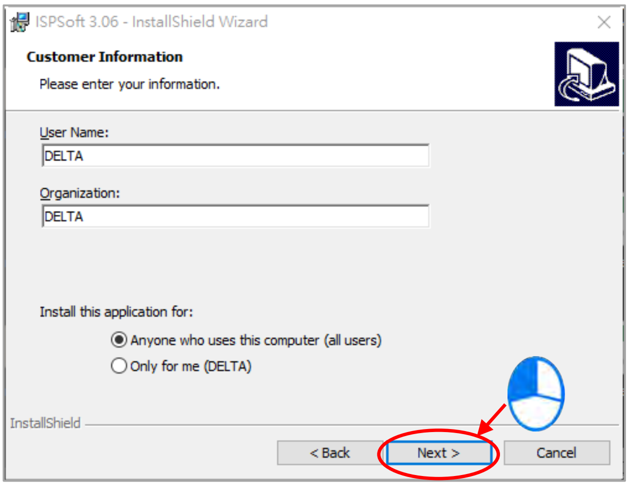
(7) After the ISPSoft x.xx – Install Shield Wizard window appears, click **Next**.



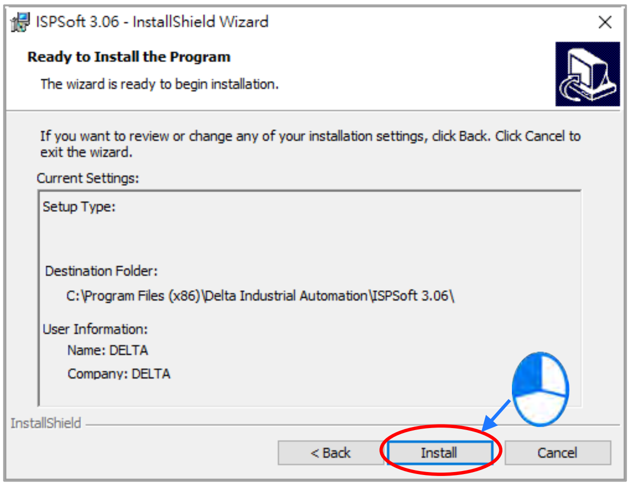
(8) Select **I accept the terms in the license agreement** and click **Next**.



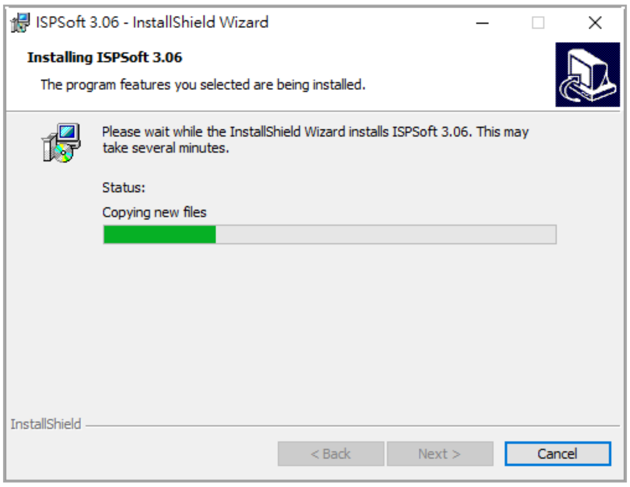
(9) Type the necessary information in the **User Name** and **Organization** boxes, and then click **Next**.

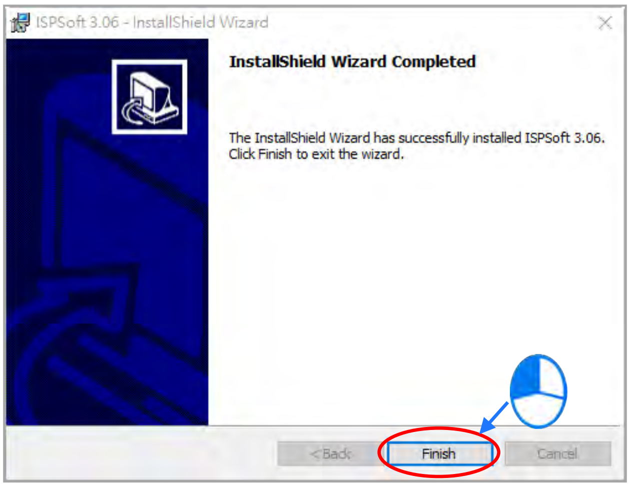


(10) Check if the installation information is correct and then click **Install**.

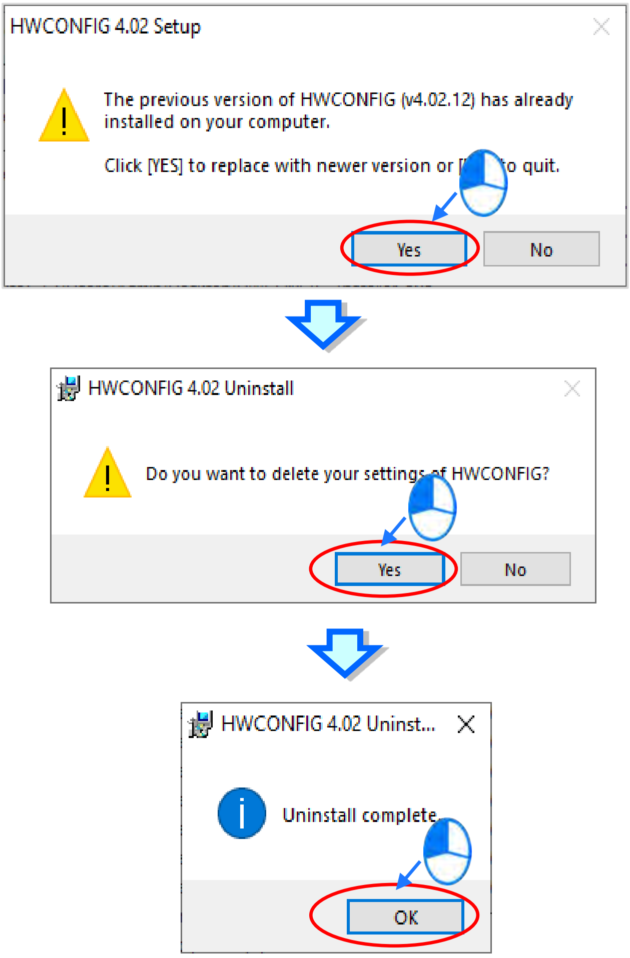


(11) After ISPSoft is installed, click **Finish** to complete the installation.



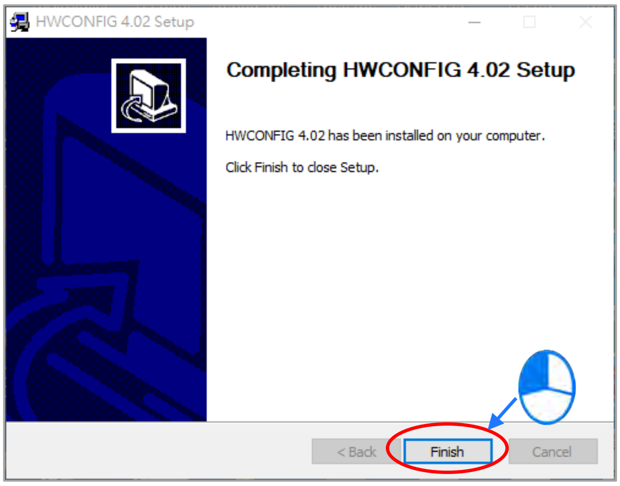


(12) Next the HWCONFIG is about to be installed. If there is a previous version of HWCONFIG installed in your computer. The following image appears. Click **Yes** to replace the previous version of HWCONFIG with a newer version.

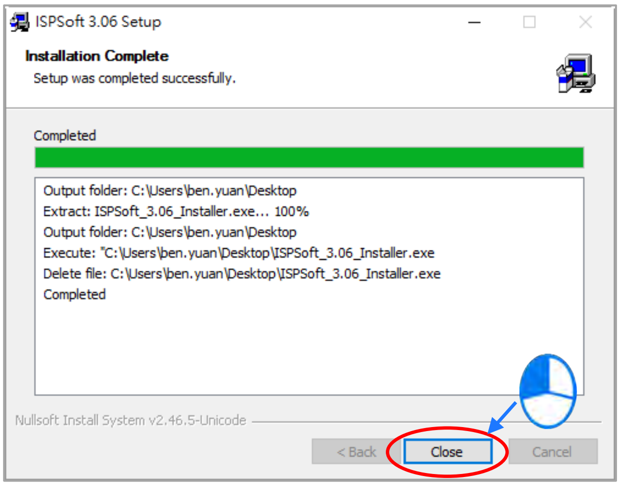


(13) Click **Install**, once the installation window appears.

(14) After HWCONFIG is installed, click **Finish** to complete the installation.



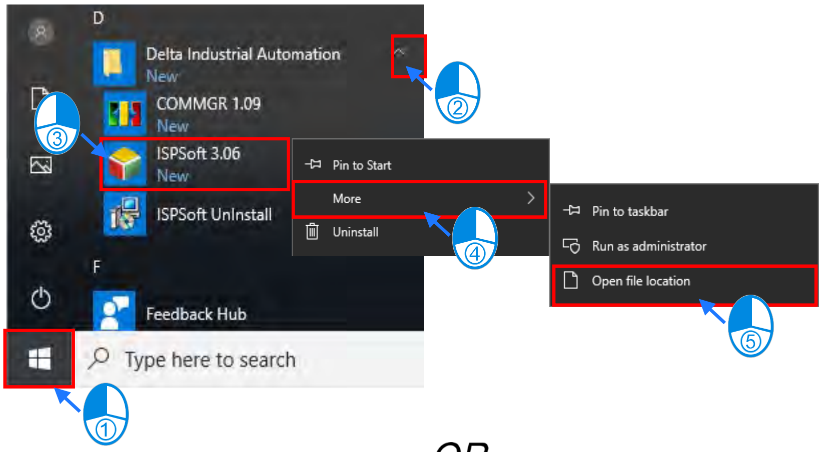
(15) After installation is done, the installation program creates shortcuts on the desktop and the Start menu. Click **Close** to complete the installation.



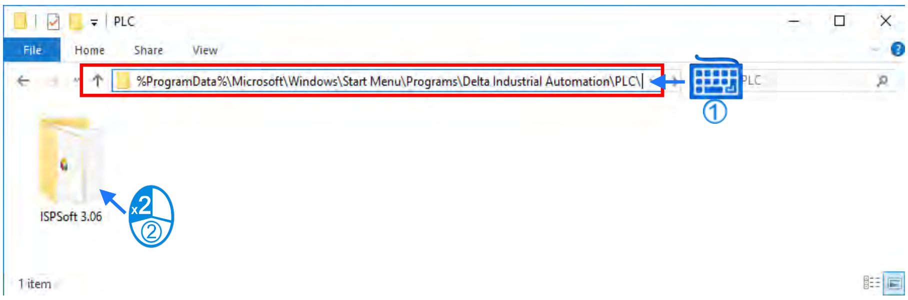
3.1.2 Uninstalling ISPSoft

(1) Generally, you can click **ISPSoft Uninstall** or select **Programs** under **Control Panel** to remove the ISPSoft; when **ISPSoft Uninstall** is not found, there are two methods to uninstall the software:

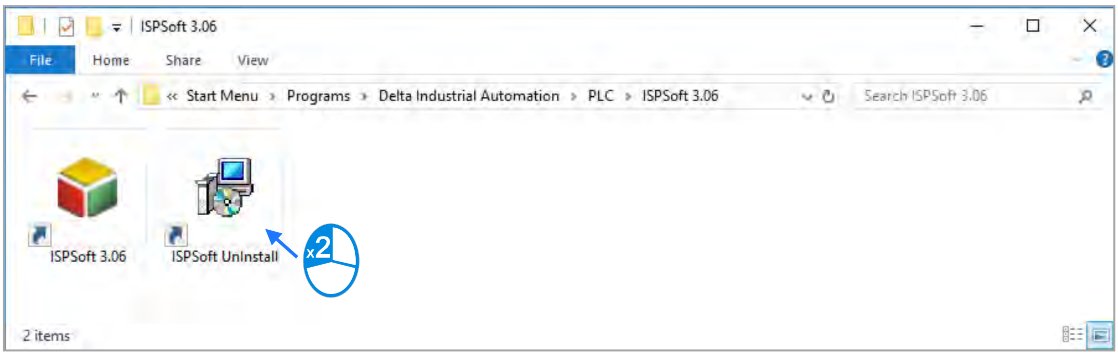
- Method 1: Select **ISPSoft x.xx** from the Windows list, click **More** then select **Open file location.**
- Method 2: Place **%ProgramData%\Microsoft\Windows\Start Menu\Programs\Delta Industrial Automation\PLC** in the address box and press Enter. Then, double click ISPSoft x.xx file.



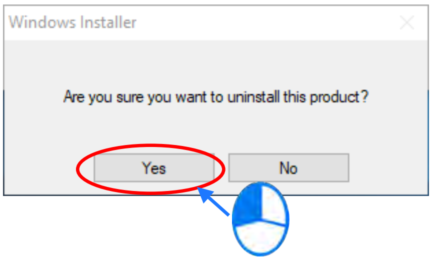
OR

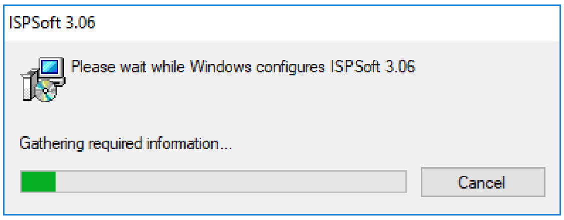


(2) Remove the software by double-click the **ISPSoft UnInstall**.



(3) To uninstall ISPSoft, click **Yes** shown in the pop-up window. The window will automatically close once the software is removed.





3.2 Installing and Uninstalling COMMGR

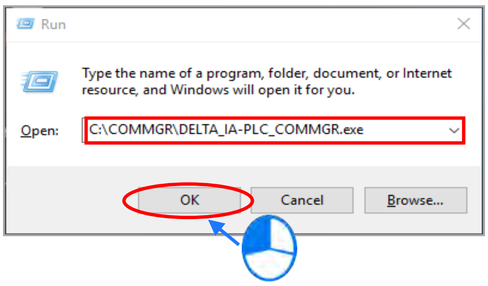
3.2.1 Installing COMMGR

COMMGR is a software independent of ISPSoft. It must be installed separately. When the previous version of COMMGR is detected in a computer, that version is advised to be uninstalled first before the latest COMMGR can be installed.

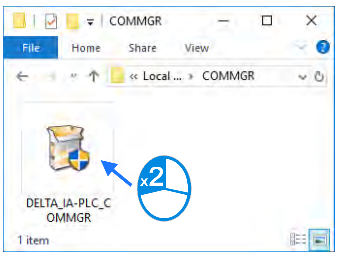
(1) Start a computer and enter the Windows operating system. You need to log on to the system as a system administrator before installing COMMGR.

(2) Put a COMMGR CD in the CD-ROM drive, or download the installation program from official Delta website http://www.deltaww.com/. Before you install the program downloaded from the website, you must decompress the file.

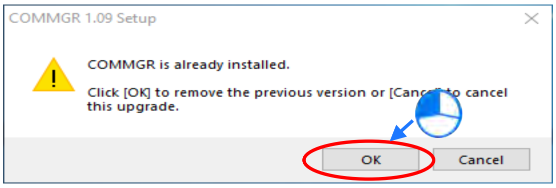
(3) Click **Start**, and then click **Run…** to open the **Run** window. Specify the path to the file called setupComm.exe in the **Open** box, and then click **OK**. Alternatively, you can double-click the icon which is used to install COMMGR to execute the installation program.

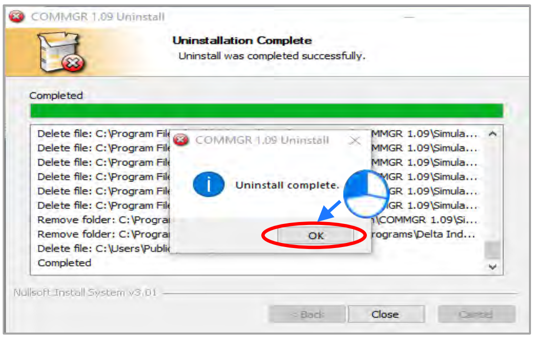


OR

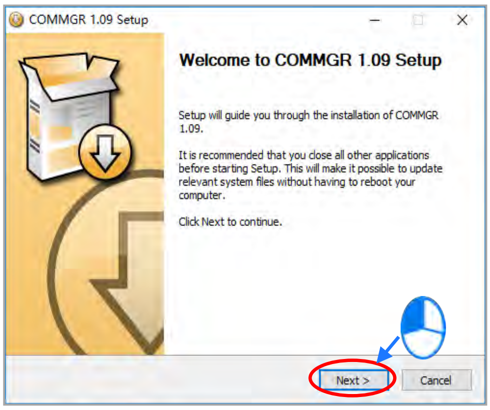


(4) When the previous version of COMMGR is installed, click **OK** to remove that version shown in the pop-up window (see below) and when uninstall is complete, click **OK** again.

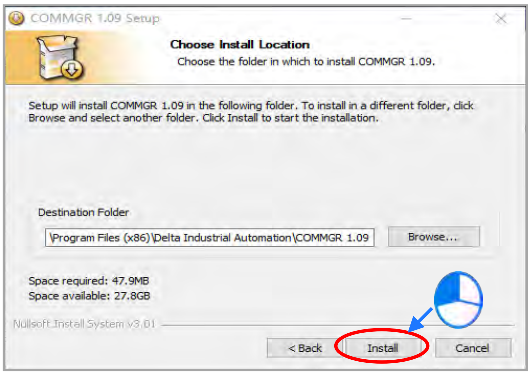




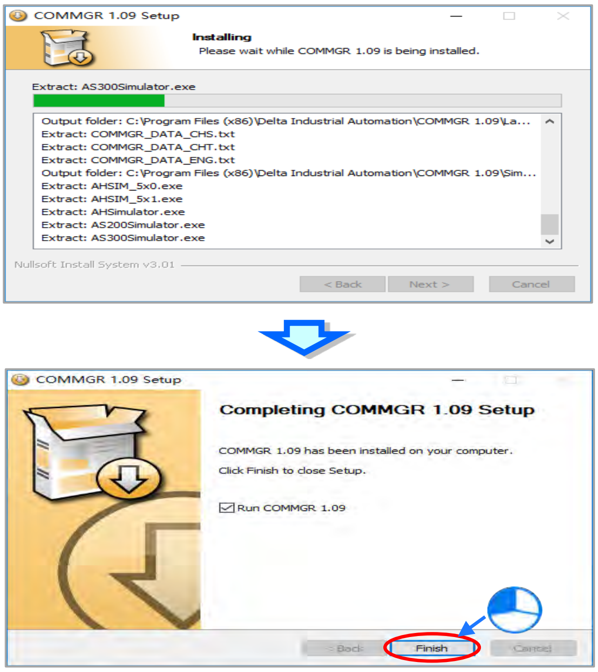
(5) Click **Next** after the Setup window appears.



(6) Use default setup in the destination folder. Click **Install** to start the installation.

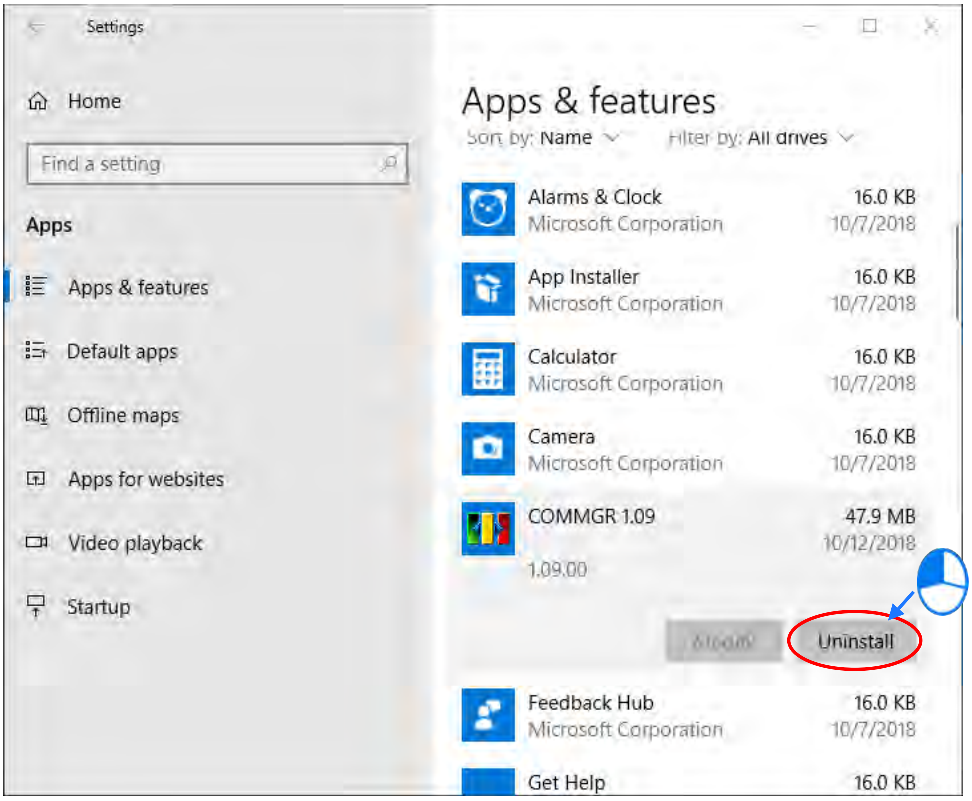


(7) After you install COMMGR, the installation program creates a shortcut to the program on the **Start** menu. Click **Finish** to complete the installation.

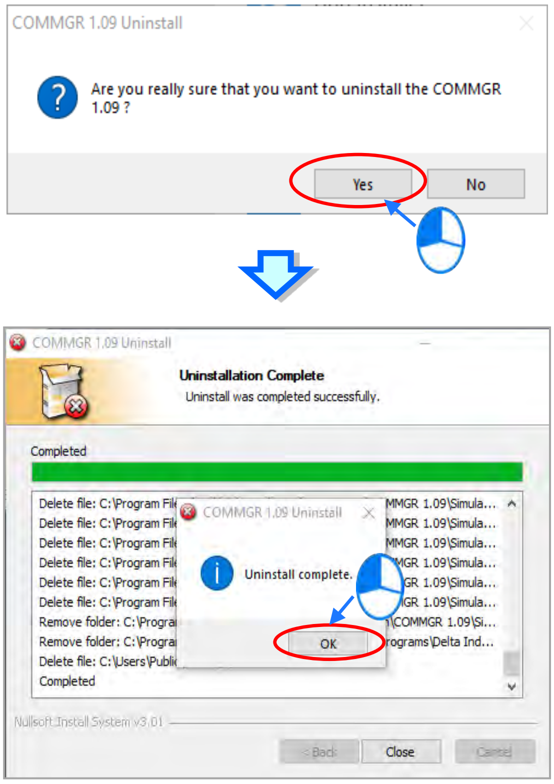


3.2.2 Uninstalling COMMGR

(1) Enter the settings of **Apps & features** in Windows, select **COMMGR x.xx** and click **Uninstall**.



(2) Click **Yes** and then **OK** to complete COMMGR uninstallation.



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